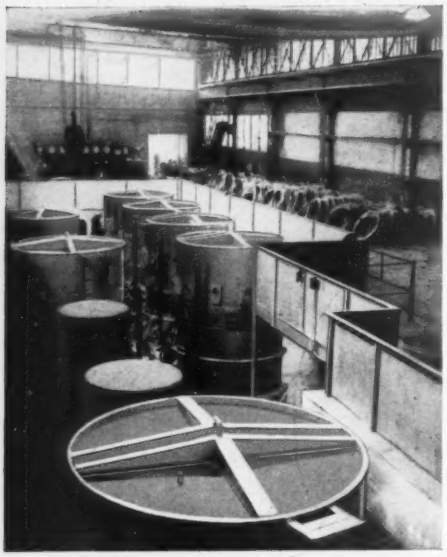
WIRE AND WIRE PRODUCTS

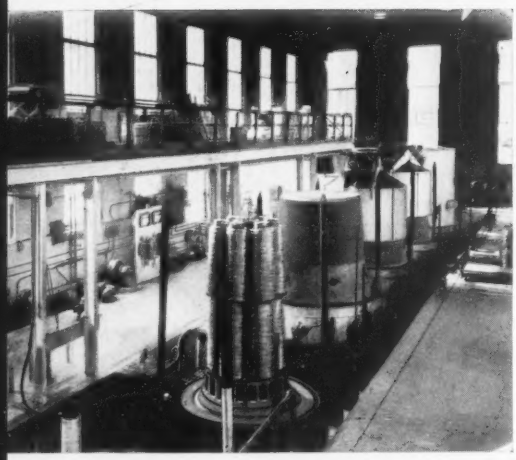
AUGUST 1944

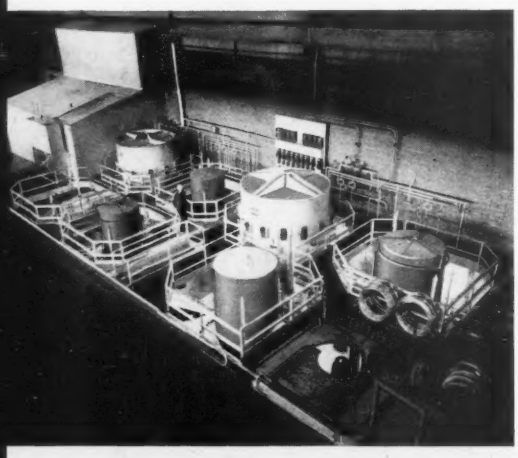
RGAN CONSTRUCTION COMPANY WORCESTER. MAS

WILSON

WIRE ANNEALING FURNACE INSTALLATIONS







This partial list of Wilson Furnace users in the Wire Industry is proof of the acceptance of this equipment for WIRE ANNEALING

SENECA WIRE COMPANY
FOSTORIA, OHIO
TOWNSEND COMPANY
NEW BRIGHTON, PA.
STEEL CO. OF CANADA
HAMILTON
WICKWIRE BROS. CO.
CORTLAND, N. Y.
WICKWIRE SPENCER COMPANY
BUFFALO, N. Y.
PAGE STEEL & WIRE
MONESSEN, PA.
NATIONAL SCREW & MFG. COMPANY
CLEVELAND, OHIO
SHEFFIELD STEEL CORP.
KANSAS CITY, MO.
WORCESTER WIRE WORKS
WORCESTER, MASS.
REYNOLDS WIRE COMPANY
DIXON, ILL.
LACLEDE STEEL COMPANY
ST. LOUIS, MO.
ROEBLING, JOHN A. SONS CO.
TRENTON, N. J.
ATLANTIC WIRE COMPANY
BRANFORD, CONN.
EATON MFG. COMPANY
MASSILLON, OHIO
GENERAL CABLE COMPANY
ROME, N. Y.
RUSSELL BURDSALL & WARD
ROCK FALLS
SHEFFIELD STEEL OF TEXAS
HOUSTON, TEXAS
RUSSELL BURDSALL & WARD
PORT CHESTER
COPPERWELD STEEL COMPANY
WARREN, OHIO
GILBERT & BENNETT MFG. COMPANY
GEORGETOWN, CONN.
KAISER COMPANY
FONTANA, CALIFORNIA
WILSON STEEL & WIRE COMPANY
CHICAGO, ILL.
ATLAS TACK COMPANY
FAIRHAVEN, MASS.

ENGINEERED AND CONSTRUCTED BY THE

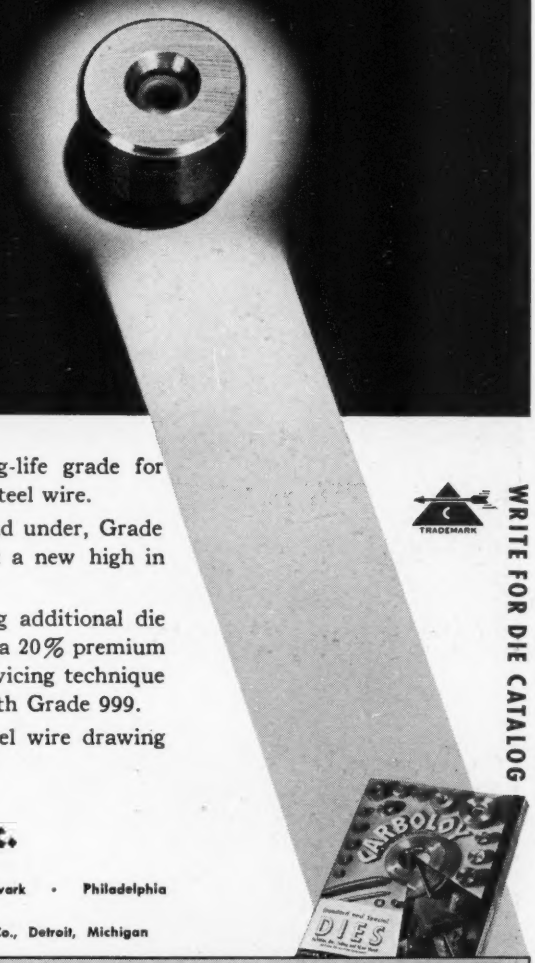
Lee Wilson ENGINEERING Co., Inc.
20005 West Lake Road CLEVELAND, OHIO
Telephone ACademy 4670

The Wilson Annealing Unit is covered by Patents Nos. 1,852,402. 2,068,4 7. 2,079,356. 2,081,612. 2,089,843. and other patents pending.

INDUSTRIAL FURNACES ★ RADIANT TUBE HEATING ★ HEAT TREATING PROCESSES

ANNOUNCING GRADE 999

FOR GREATER DIE LIFE ON FINE STEEL WIRE



We announce Grade 999 for R-1 dies—a special, long-life grade for premium performance, extra-long life, in the drawing of fine steel wire.

Recommended for use in wire sizes approximately .015″ and under, Grade 999 is an ultra-hard, ultra-wear resistant grade that has set a new high in carbide die life.

Due to the special characteristics of Grade 999—requiring additional die fabricating operations—R-1 dies of this grade are available at a 20% premium over prices for standard R-1 dies. The same finishing and servicing technique you now use for standard Carboloy Dies may be followed with Grade 999.

For a new, higher order of performance on your fine steel wire drawing specify R-1, Grade 999. In stock for prompt delivery.

TRADEMARK

WRITE FOR DIE CATALOG

CARBOLOY COMPANY, INC.
11171 E. 8 MILE STREET, DETROIT 32, MICHIGAN

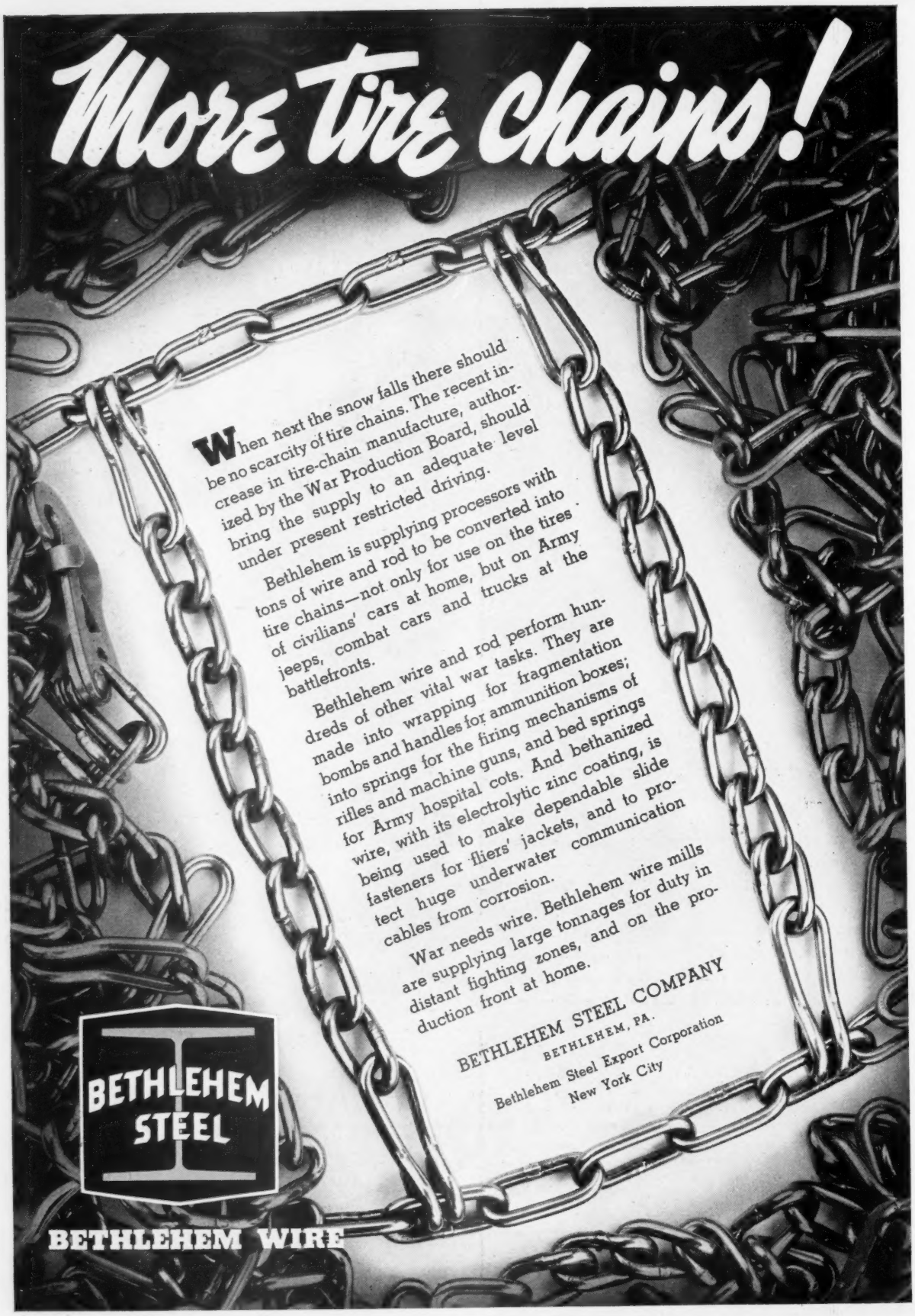
Birmingham • Chicago • Cleveland • Detroit • Los Angeles • Newark • Philadelphia
Pittsburgh • Seattle • Thomaston, Conn.

Authorized Distributors: Hartley Wire Die Co., Thomaston, Conn.; Michigan Wire Die Co., Detroit, Michigan

CARBOLOY CEMENTED CARBIDES

TRADEMARK TRADEMARK

COMPLETE DIE SERVICE FOR WIRE, BAR, TUBING AND SHEET METAL


More tire chains!
When next the snow falls there should be no scarcity of tire chains. The recent increase in tire-chain manufacture, authorized by the War Production Board, should bring the supply to an adequate level under present restricted driving.
Bethlehem is supplying processors with tons of wire and rod to be converted into tire chains—not only for use on the tires of civilians' cars at home, but on Army jeeps, combat cars and trucks at the battlefronts.
Bethlehem wire and rod perform hundreds of other vital war tasks. They are made into wrapping for fragmentation bombs and handles for ammunition boxes; into springs for the firing mechanisms of rifles and machine guns, and bed springs for Army hospital cots. And bethanized wire, with its electrolytic zinc coating, is being used to make dependable slide fasteners for fliers' jackets, and to protect huge underwater communication cables from corrosion.
War needs wire. Bethlehem wire mills are supplying large tonnages for duty in distant fighting zones, and on the production front at home.
BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.
Bethlehem Steel Export Corporation
New York City
BETHLEHEM STEEL
BETHLEHEM WIRE

For Every Spring Grinding Job . . .

NORTON DISCS

Engineered to the job — that's the reason for the success of Norton Disc Wheels in increasing spring grinding production. And they can be expertly engineered because of these Norton facilities:

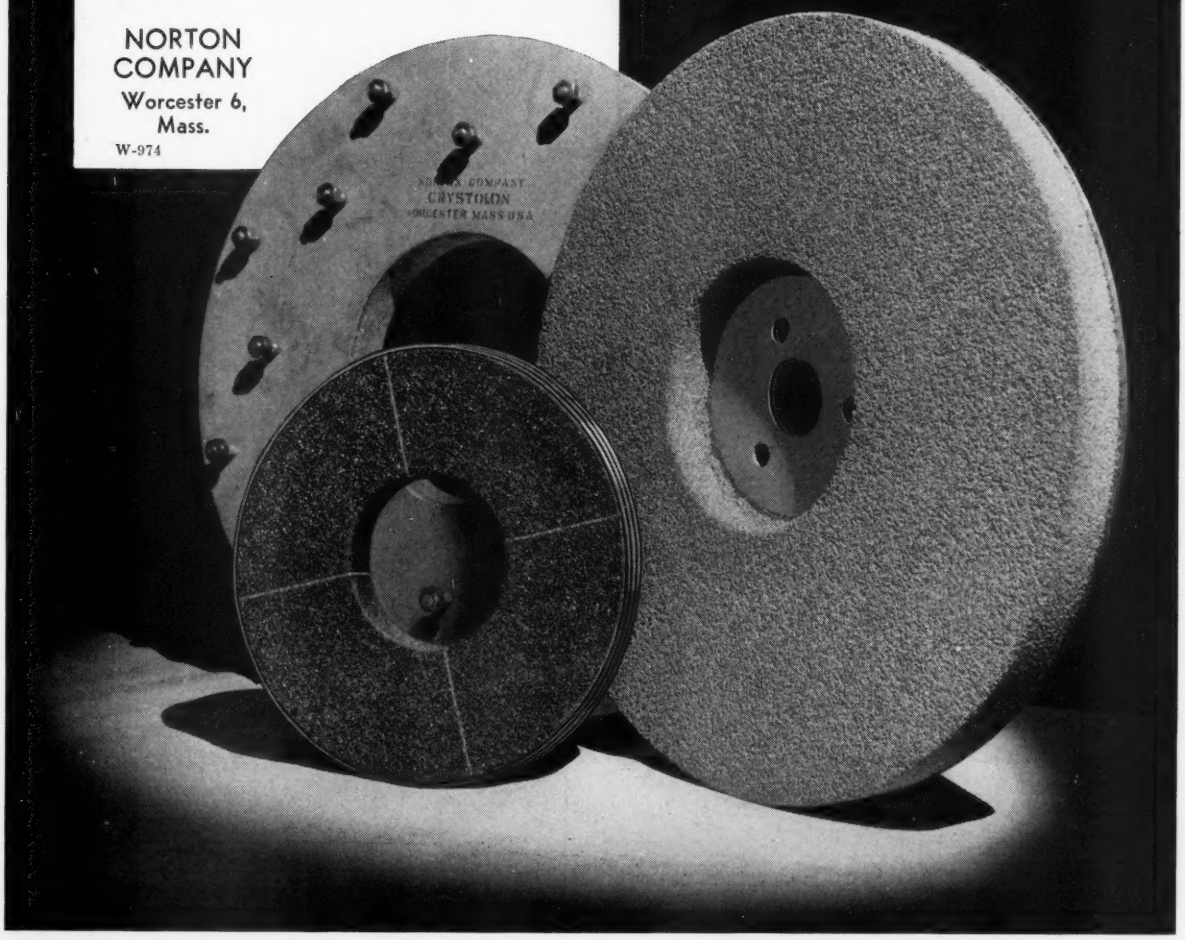
1. Resinoid, silicate and vitrified bonds — whichever your particular job requires.
2. The patented Controlled Structure process of manufacture that assures uniformity throughout each disc and from disc to disc.
3. Segmental and solid type discs with mountings to fit all sizes and kinds of grinders.
4. Experienced engineers the country over to give expert help on disc wheel selection.

It will pay you to use Norton Discs on your spring grinding jobs.

NORTON COMPANY
Worcester 6, Mass.

W-974

NORTON ABRASIVES



WHY CONTINUE WITH DRAWING TROUBLES?

"WE ALL HAVE PROBLEMS; MINE FOR INSTANCE IS DIES. CONSTANT RE-PLACEMENTS ARE COSTLY AND CAUSE CONSIDERABLE TIME-LOSS"
"TIME-LOSS WITH US IS NOT AS SERIOUS AS THE REJECTIONS DUE TO SCRATCHES & BREAKAGE"
"ADD TO THAT METAL PICK-UP"
"WE FEEL WE SHOULD GET MORE DRAFTS WITH-OUT RE-COATING"
"WE WENT THRU ALL THESE EXPERIENCES UNTIL WE BEGAN TO . . .
Cuprodize with CUPRODINE . . .

"We have found CUPRODINE to be the ideal lubricant for us—let me tell you why:

"CUPRODINE is more than a lubricant. When it copper coats (without current) it reacts with the steel, dissolving minute quantities to form a thin, adherent copper coating. The microscopic points present on steel surfaces are dissolved and a smooth coated surface remains which will not mar or scratch the face of the die.

"You'll find scratches reduced because on Cuprodized metal there are no tiny points left to fuse to the face of the die and cause scratches. Proper lubrication also minimizes pick-up.

"We find that wire or other products withstand more drafts when Cuprodized than when coated with the usual acid copper or the soap solutions."

CUPROTEK is a new chemical aid in metal finishing which protects, from rust or corrosion, products which have been Cuprodized or copper plated, should it be necessary to store or ship these coated materials before drawing.

The ACP technical department will gladly advise with you and recommend the method and grade of CUPRODINE that is best suited to meet your requirements.

Write for Technical Service Data Sheets.

Manufacturers of Inhibitors & Metal Working Chemicals

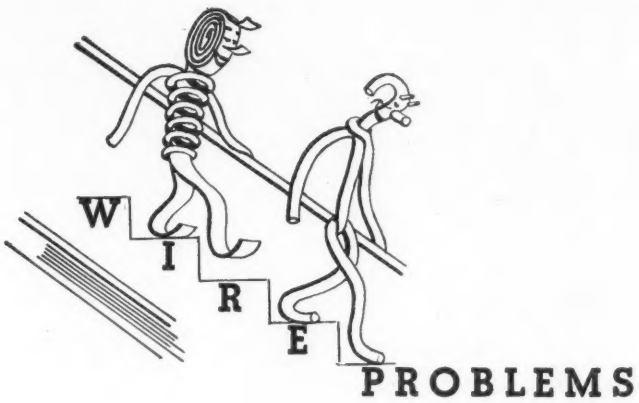
AMERICAN CHEMICAL PAINT CO.
AMBLER ACP **PENNA.**

Note: West Coast Plants may address inquiries and orders for prompt delivery to: Leon Finch, Ltd., 728 East 59th St., Los Angeles, Calif.

CHEMICALS ACP PROCESSES

American Chemical Paint Company, Ambler, Pa.
Please send me general Technical Service Data Sheets on
☐ Cuprodine ☐ Cuprotek

*Name*_____ *Title*_____
*Company*_____
*Address*_____
D-8



Let WICK and SPEN solve *YOUR* wire problems

When "Wick" and "Spen" are called in to help solve a wire problem they get down to the bottom of things. In determining the type of wire required, careful consideration is given to the way it's to be used —the amount of forming or processing it must undergo—and the service requirements of the finished product.

Then our metallurgists determine the carbon content, annealing, cleaning, finishing procedures—and establish the necessary laboratory control tests. And to assure uniform quality we make and process our own steel in our own open hearths, and draw it in our own modern wire mills.

These operations are not any recent development. After all, when you've pioneered in making wire and wire products for 123 years you learn a lot about it. And our long experience in this field accounts for the confidence which manufacturers have in products bearing the Wickwire Spencer label.

If you have a need for steel wire, come to Wire Headquarters. We can supply high or low carbon steel wire, round or shaped, in a wide variety of sizes, tempers, grades and finishes.

Send your wire questions to

WICKWIRE SPENCER STEEL COMPANY

500 FIFTH AVENUE, NEW YORK 18, N. Y.

Abilene • Buffalo • Chattanooga • Chicago • Detroit • Houston • Los Angeles • Philadelphia • San Francisco • Tulsa • Worcester

In appreciation

YOUR acceptance of Syncro products has increased our business to such an extent that it has been necessary for us to move to new and larger quarters twice within the past seven years. For this we are deeply appreciative.

We firmly believe that the basic reason for our growth lies in the fact that we have never been satisfied to follow others' designs. We have never become complacent. On the contrary, since our entry into the wire machinery industry, we have constantly searched for better, faster and more efficient methods and designs. That this policy is right is proved by the ever increasing volume of Syncro products going into wire mills throughout the United States and abroad.

Our larger and better equipped research department at our new plant in Perth Amboy, N. J., will enable us to increase our research activities which are so mutually beneficial.

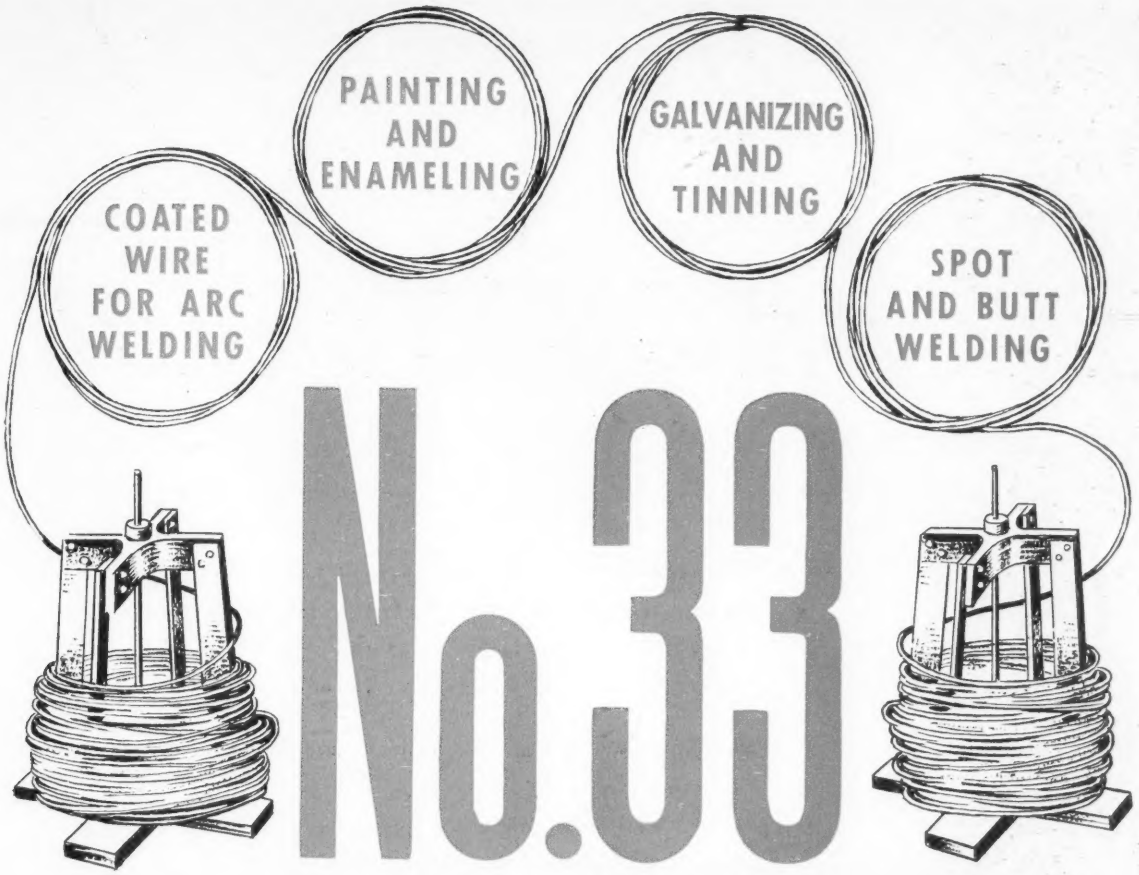
SYNCRO MACHINE COMPANY

611 SAYRE AVENUE
PERTH AMBOY, N. J.
113 SOUTH JEFFERSON STREET
CHICAGO 6, ILL.

REPRESENTED IN CANADA BY CANADIAN ELEVATOR EQUIPMENT CO. LTD., TORONTO

Machinery for the Wire Industry

SYNCRO

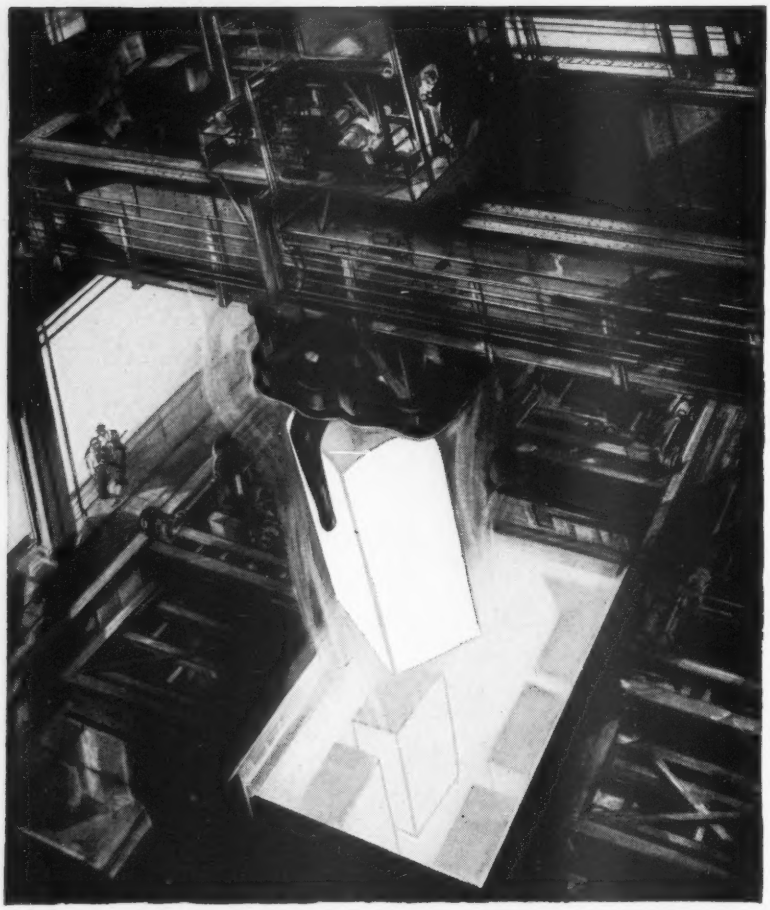


FOR EXTRA BRIGHT FINISH

NUMBER 33 is designed to secure *extra bright finish* on one or two draft for use on wire to be coated for arc weld, spot and butt welding, for painting, enamelling, galvanizing and tinning. It is used with light lime wash on one hole, and 2% to 3% on two holes.

NUMBER 33 is put into the lubricant-box as shipped and after drawing approximately half a bundle, will set up its own rolling motion. As it picks up lime from the rod, water should be added to give it its original viscosity and consistency. With fresh additions of new material, it will run continuously. Quantities for test furnished free of charge.

STANDARD INDUSTRIAL COMPOUNDS CO.
4600 W. Ferdinand St. • Chicago 44, Ill.



BAPTISM OF FIRE
FOR STEEL INGOTS

The baptism of fire that steel ingots receive in the great gas-fired furnaces, known as soaking pits, conditions them for further processing. It is one of the many applications of heat in the production of steel. For heat is the agent that reduces raw materials into iron, converts iron into steel, helps shape and finish steel into the infinite number of forms in which it serves.

In the manufacture of steel, great progress has been made in the study, analysis, and control of heat. The attention paid to the application of heat is as careful as that paid to the scientific determination of the materials used in producing steel, the most useful of metals—steel to arm our fighting men with superior weapons—steel in abundance for broader peace-time employment.

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH, PENNSYLVANIA
J&L STEEL

CONTROLLED QUALITY STEEL FOR WAR

SOAKING PITS

Holes in the ground were the first device for evenly distributing throughout the steel ingot, the heat from its molten interior to its solid exterior, to make it ready for rolling. John Gjers, Swedish-born steel engineer of England, in 1882, seeking to avoid time-wasting, costly practice of allowing ingots to cool and then reheating them to rolling temperatures, placed each ingot in a brick-lined, covered hole in the ground. These heat-retaining holes, forerunners of modern, complex steel ingot-heating furnaces, were called "soaking pits." The holes have long been obsolete, but the name lingers on.

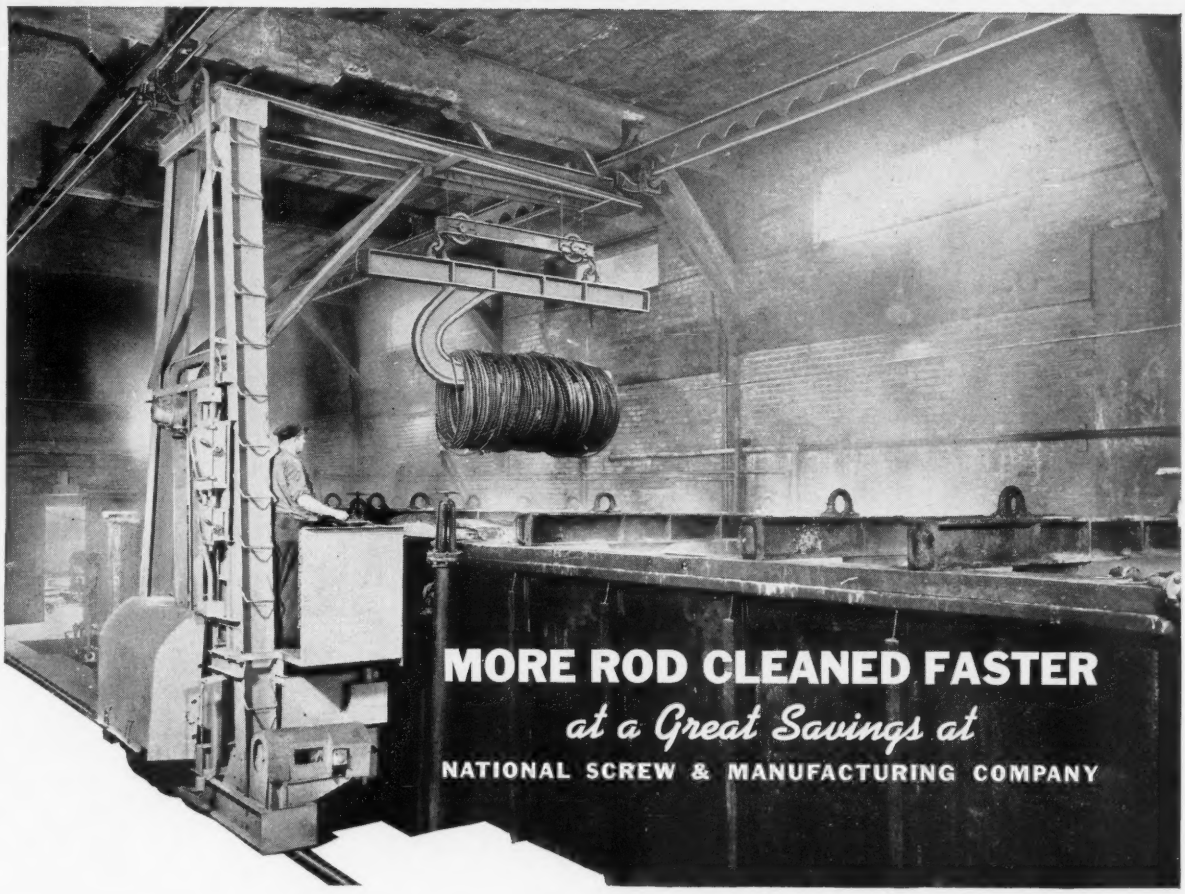
Gjers' idea was successful from the start and the new practice spread from England to the Continent and to the United States within a dozen years. The Henry Bessemer medal was awarded Gjers in 1894 by the British Iron and Steel Institute "for great service" to the industry by his soaking-pit invention and other improvements in iron and steel production.

The baptism of fire given steel ingots today in modern, intricate, scientifically heat-controlled and skilfully tended ingot, heating furnaces, is a far cry from the holes in the ground put to use by the son of a Swedish army officer in England back in the 80's. The soaking of ingots in pits is one of the most important steps today in the march of steel from iron ore to finished product. Without soaking pits there could not have been the present record production of steel for war—90,000,000 tons last year in the United States, more than all the rest of the world.

Shriller than a bo'sun's in a gale, is the whistle piercing the deep undertones of a steel mill that is the signal to start ingots coming up from the soaking pits to the blooming mill to be rolled into long blooms or wide slabs. After this first rolling, the steel passes on through other mills and other processes to wind up in many sizes, shapes and grades adaptable for manufacture of countless articles useful in peace, as well as war.

Only 15% of surgical instruments sold in this country before the war were made here. Now most instruments and hospital equipment for our armed forces are American made. The industry is producing about 60,000 tons of special steels for some 5,000 applications required by Army and Navy Medical Corps. This entailed learning how to achieve production of many highly specialized steels formerly imported from Europe.

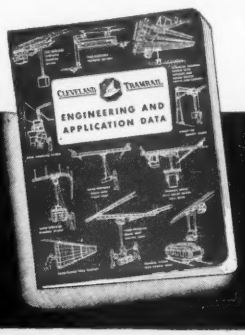
Conquering new horizons in metallurgy since World War I, American scientists have put the U.S.A. far ahead in production of better industrial steels, and in development of super-fine special steels. For example they have (1) Created new high temperature and corrosion-resistant steels for hospital and laboratory; (2) Helped make possible the mass fabrication of these steels into surgical instruments of unparalleled efficiency; (3) Materially aided vast life-saving developments within the pharmaceutical industry.



In the summer of 1941 the National Screw & Manufacturing Co., Cleveland, installed a Cleveland Tramrail Cleaning House Gantry Crane in the same building that long had been used as their cleaning house. The equipment was erected over a week-end and ready Monday morning without interrupting the production schedule.

The installation has proven highly successful. More rod is cleaned faster with approximately two-thirds of the man-hours of labor formerly required. Eight 300-pound, 48-inch O. D., coils are handled as a unit load through the cleaning line. The layout consists of two four-pin rubber-lined acid tubs, a combination high pressure water spray and rinse tank, a lime tub and a flash baker, all set on the floor for easy maintenance. All operations through the cleaning and baking cycle are handled by the operator of the gantry crane.

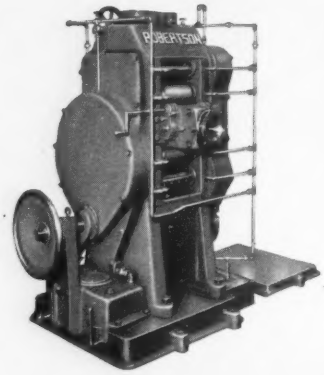
A straight cleaning house layout with a Cleveland Tramrail gantry crane requires less space, **enforces** cleanliness, orderliness, and better working conditions, all at a lower cost per ton of rod cleaned.

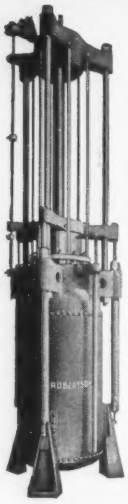


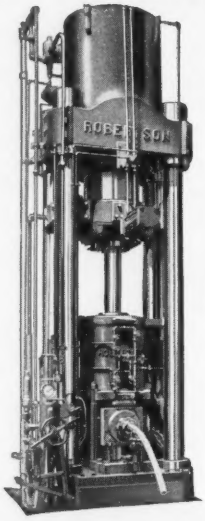
GET THIS BOOK!
BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

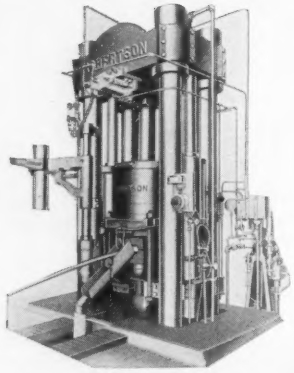
CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
1175 EAST 283RD ST. WICKLIFFE, OHIO.

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

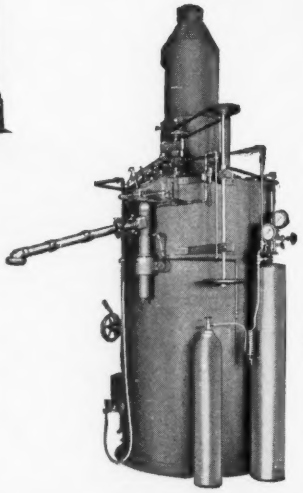


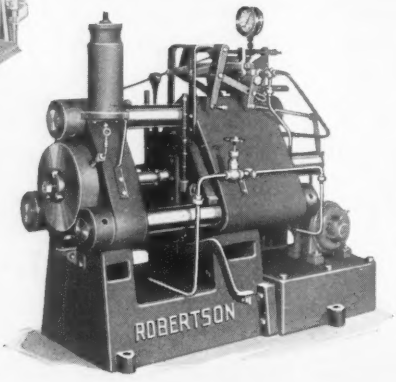


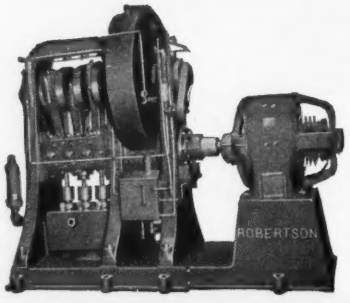




WHAT DO YOU PAY
FOR LEAD HOSE & CABLE
ENCASING EQUIPMENT?







Robertson machines have long done an excellent job in *increasing* lead hose and cable encasing *production output . . . reducing costs* and *improving efficiency*.

Robertson experience is based on more than three quarters of a century of building Hydraulic Machinery.

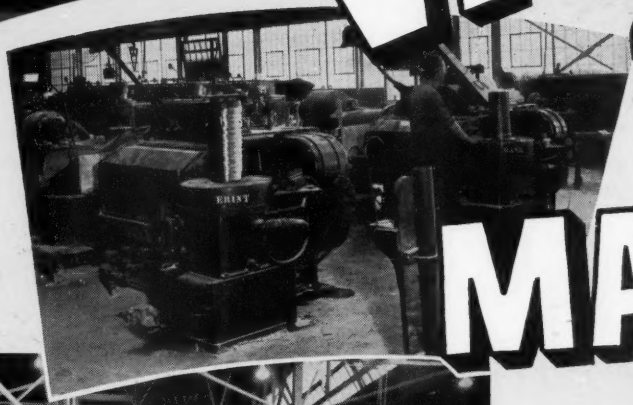
JOHN Robertson
COMPANY INCORPORATED

125-135 WATER STREET, BROOKLYN 1, NEW YORK
Designers and Builders of all Types of Lead Encasing Machinery
Since 1858

VAUGHN

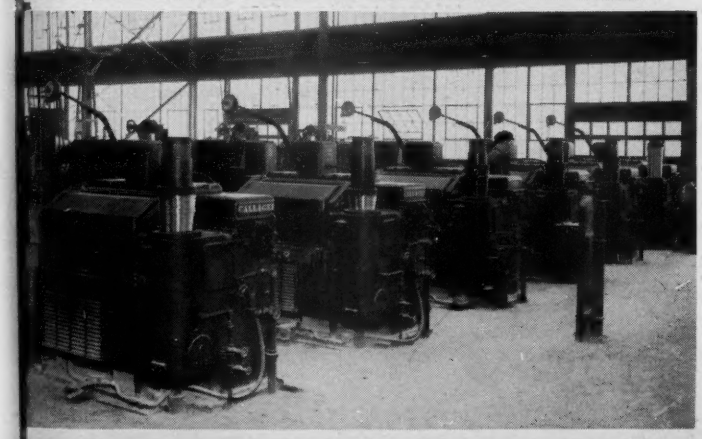
Wire Drawing

MACHINERY



Versatility for

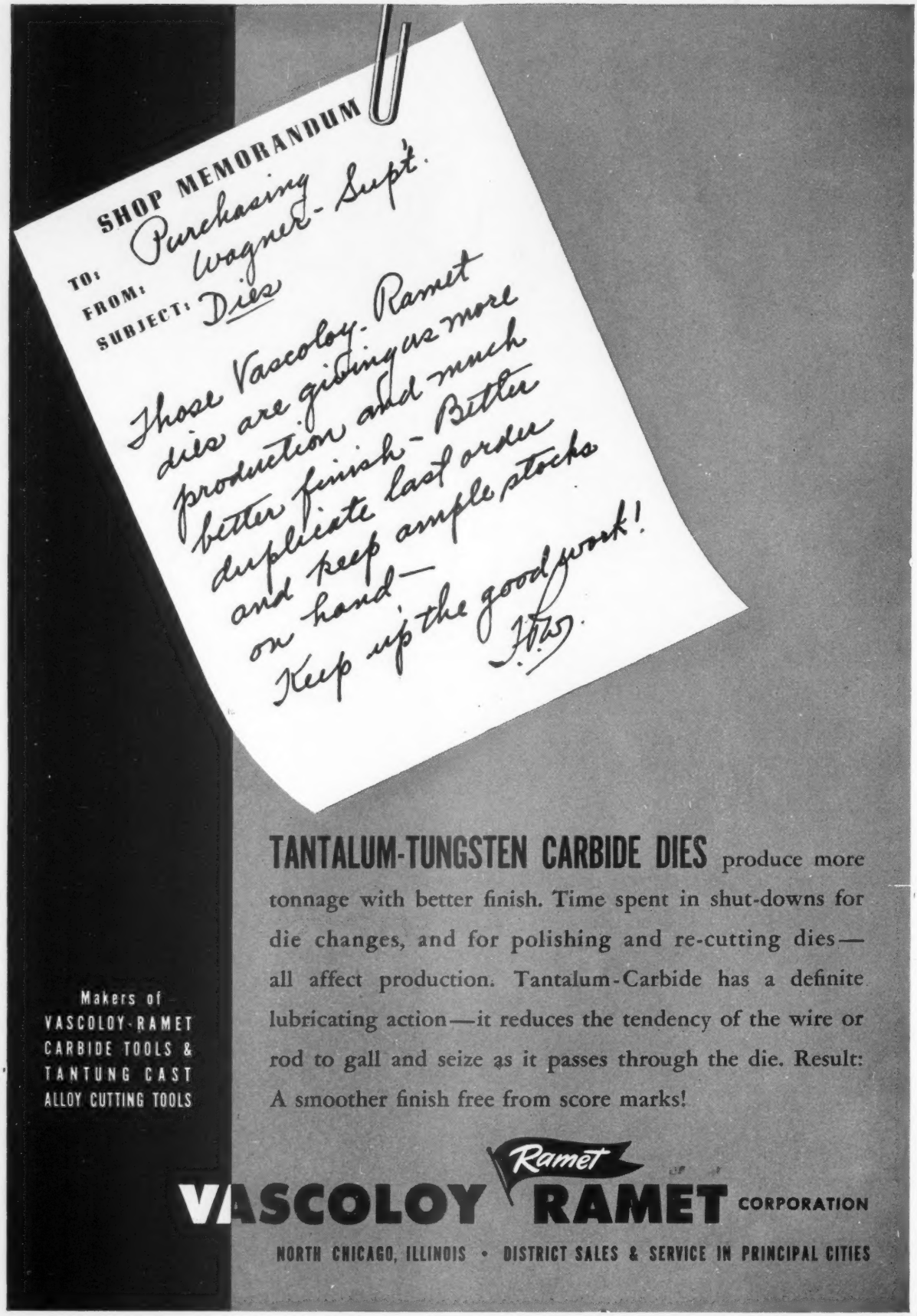
THE GREATEST DEMANDS OF PRESENT PRODUCTION— AND THE COMING REQUIREMENTS OF YOUR PEACETIME MARKETS!

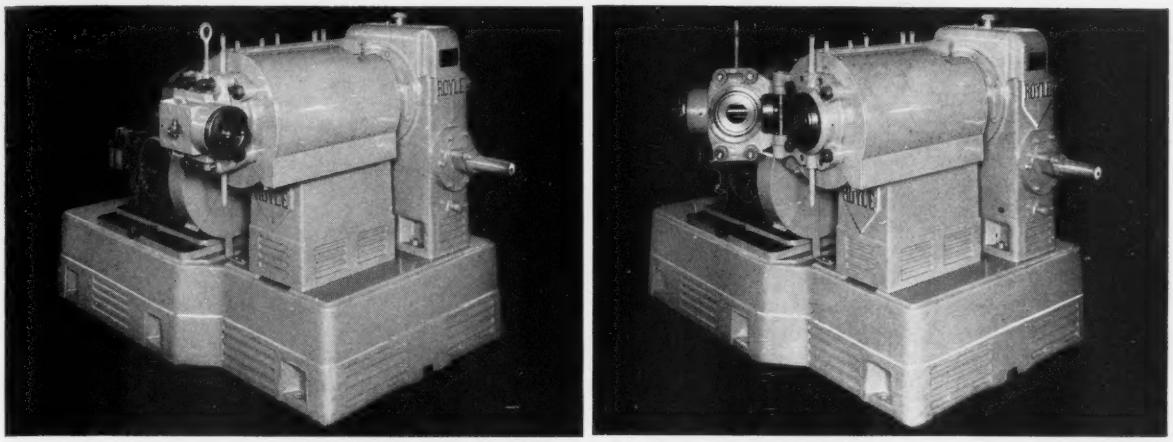


THE VAUGHN MACHINERY COMPANY

CUYAHOGA FALLS, OHIO

Complete Cold Drawing Equipment . . . Continuous or Single Hole . . . For the Largest Bars and Tubes . . . For the Smallest Wire . . . Ferrous, Non-Ferrous Materials or Their Alloys.


SHOP MEMORANDUM
TO: Purchasing
FROM: Wagner - Supt.
SUBJECT: Dies
Those Vascoloy-Ramet dies are giving us more production and much better finish - Better duplicate last order and keep ample stocks on hand—
Keep up the good work!
J.W.
TANTALUM-TUNGSTEN CARBIDE DIES produce more tonnage with better finish. Time spent in shut-downs for die changes, and for polishing and re-cutting dies—all affect production. Tantalum-Carbide has a definite lubricating action—it reduces the tendency of the wire or rod to gall and seize as it passes through the die. Result: A smoother finish free from score marks!
Makers of VASCOLOY-RAMET CARBIDE TOOLS & TANTUNG CAST ALLOY CUTTING TOOLS
Ramet
VASCOLOY RAMET CORPORATION
NORTH CHICAGO, ILLINOIS • DISTRICT SALES & SERVICE IN PRINCIPAL CITIES



NO. 2 ROYLE PLASTICS INSULATING MACHINE

"ANY INSULATION" WON'T DO WHEN YOU'RE FIGHTING A GLOBAL WAR...

The long felt need for insulating materials possessing properties not found in rubber skyrocketed as the war spread to all quarters of the globe. This was a need that had to be filled almost overnight. Delays meant the needless loss of precious lives — stymied campaigns — prolonging the war.

The ingenuity and experience of the chemical industry and wire processors had developed suitable materials for plastics insulation. John Royle & Sons—progressive pioneers since 1880 in the manufacture of extrusion machinery — were called upon to produce the necessary equipment for processing plastics insulation.

Today Royle Continuous Resin Insulating Machines are delivering plastics insulated wire in many of the nation's wire processing plants— "enough and on time".

More general applications of the Royle Continuous Resin Insulating Machine are manifesting themselves. The horizon is bright, but that must wait until the war has been won.

JOHN ROYLE & SONS

ROYLE PATERSON N. J.

PIONEER BUILDERS OF EXTRUSION MACHINES SINCE 1880

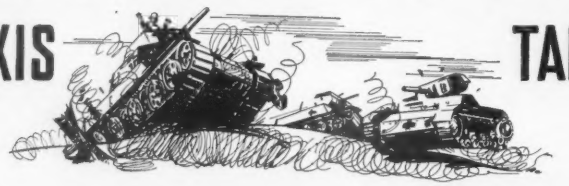
PATERSON 3, NEW JERSEY

Continental Europe
JAMES DAY (MACHINERY) LTD.
LONDON, ENGLAND

Home Office
B. H. DAVIS J. W. VAN RIPER
Sherwood 2-8262

AKRON, OHIO
J. C. CLINEFELTER
University 3726

Wild Wire Nooses

TANGLE AXIS  TANKS and TRUCKS

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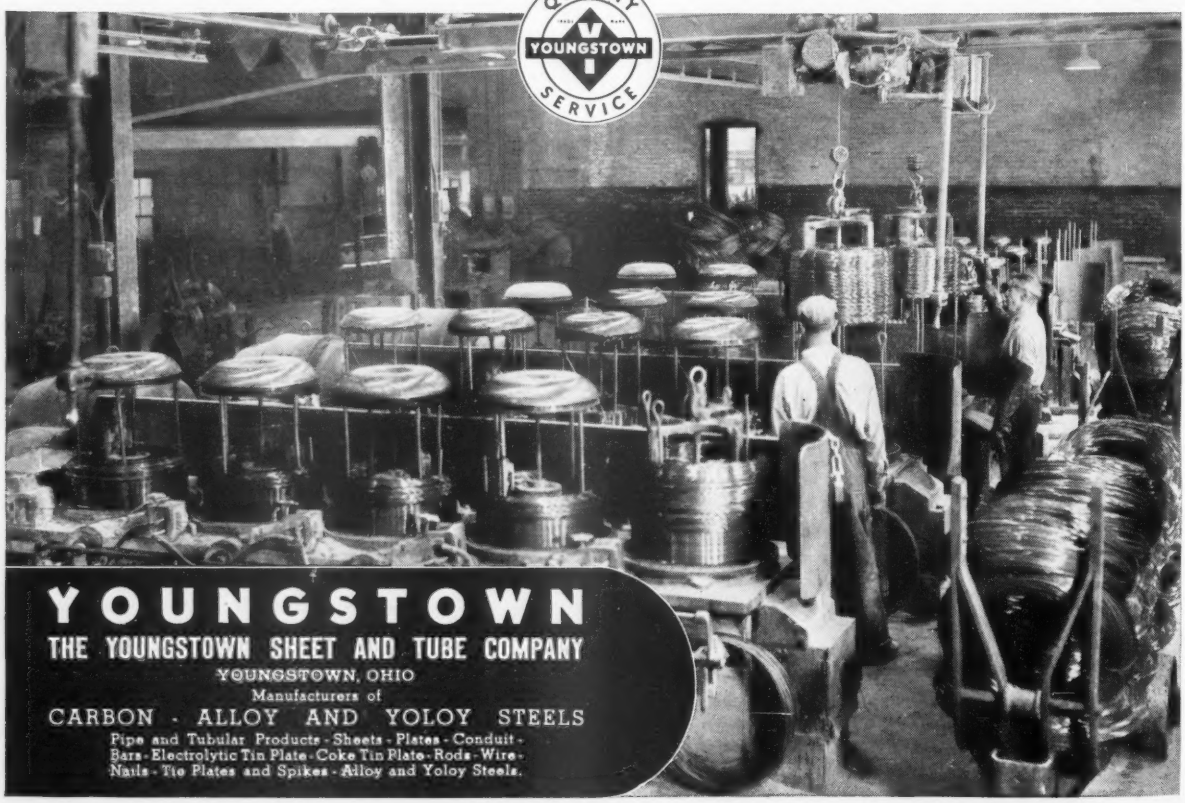

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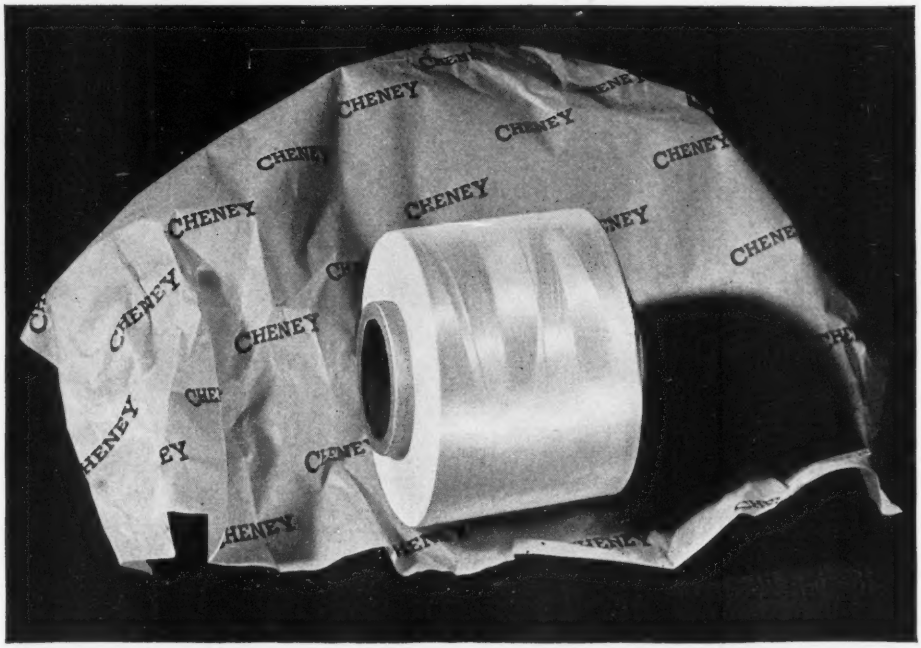

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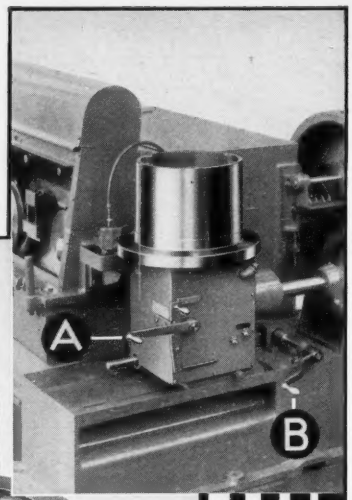

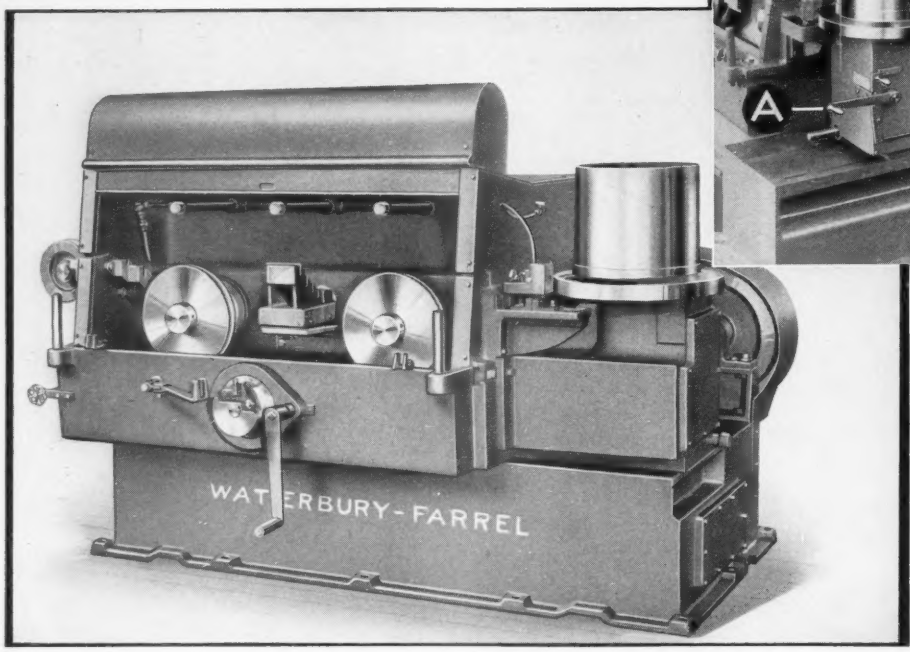

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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 19 AUGUST, 1944 No. 8

Designated as

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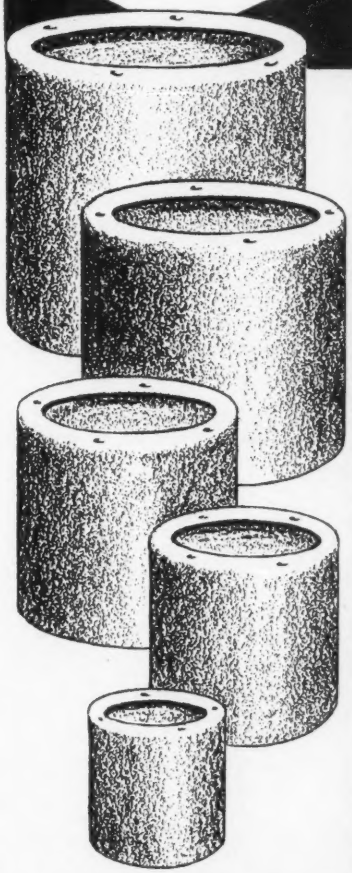

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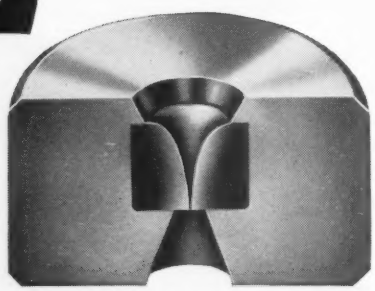
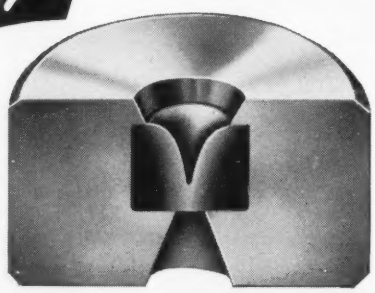


PIERCED DIE—Hole ROUGH CORED THROUGH THE NIB saves Die-User's time. Pierced hole, .003″/.004″ dia., is ready for finishing to as small as .010″ dia.

OLD WAY



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WIRE AND WIRE PRODUCTS

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Wire Products and Insulated Wire and Cable.
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Vol. 19 AUGUST, 1944 No. 8

Sub-Sieve Diamond Powders For Die Work

PART I

By Paul L. Herz,
Technical Advisor and Manager,
Belgian Tool Co., (Malines, Belgium).

Introduction

THE problem of producing accurately graded powders so that their performance can be estimated has long plagued both die makers and wire mills.

✦ ✦ ✦

GENERALLY speaking, powders now used for die making and repolishing cannot be called satisfactory by any stretch of the imagination.

✦ ✦ ✦

THE test is easy; examine through the microscope a sample of your powder placed on a counting block and check your size. Many will be astonished at the disparity of sizes.

✦ ✦ ✦

IT is not generally realized how much of the trouble encountered both in the making of dies and drawing of wire can be traced back to badly graded powders.

THIS journal told us a year ago that in the interest of the war effort the Bureau of Standards and Weights in Washington had taken the matter up, which was gratifying news considering its high standard of work and the unique materiel it possesses to carry out such experiments.

PAUL L. HERZ
Technical Advisor and Manager
Belgian Tool Company (Malines, Belgium)

HOWEVER, I believe that in these times when quick results are essential, a parallel effort made by all those interested in the commercial production of graded powders, as well as by those who are in need of them for their industry would likely produce quicker results.

✦ ✦ ✦

SURELY commercial incentive and industrial need are the most potent levers of industrial progress. So by enrolling our great army of industrialists we can hasten the solution of this irksome problem.

✦ ✦ ✦

WITH this idea in mind I submit this paper hoping that it may avoid the necessity of starting from scratch or of wasting time in following paths which although logical and attractive have proven unpractical.

✦ ✦ ✦

THE encouraging results obtained through the dissemin-

Designated as Official Publication by the Wire Association

ation of information and personal experience previously published in this journal fully justifies the method.

✦ ✦ ✦

The Role of Diamond Powder in Die Making and Repolishing

DIAMOND powders are used for rapid abrasion (as in coning and drilling) or for sizing and finishing (as in polishing and repolishing).

✦ ✦ ✦

FOR each of these operations and according to the size of the hole there is an **ideal grain size** which performs the operation in the shortest time and with perfect results.

✦ ✦ ✦

ANY other grain size or combination of grain sizes will prolong the time of operation and will yield defective work.

✦ ✦ ✦

IT is evident that if, when drilling a given size hole the powder contains grains smaller than the ideal size, the work will progress too slowly, hence increased cost of labor and overhead. The same is true for polishing.

✦ ✦ ✦

ON the other hand, the presence of oversized grains in any operation will cause rifling, type of damage which cannot be repaired.

✦ ✦ ✦

THERE is for each job a definite relation between grain size and manufacturing factors such as; number of revs of the needle, pressure on the needle. frequency of the tapping and lastly viscosity of the powder oil.

✦ ✦ ✦

SHORT of a reliably sized powder we have no basis for the establishment of this relation, for drilling and polishing technique must be built on grain size.

✦ ✦ ✦

IF we fail to do that, all the work on die stones becomes empirical and can produce nothing but inferior dies.

✦ ✦ ✦

THIS same deficiency also raises the cost of production of the die and will in turn affect the price and quality of the fine wire.

✦ ✦ ✦

I HAVE pointed out previously in this journal in an article on the problems of fine wire drawing, how many delicate problems the wire drawer must solve before he can arrive at a satisfactory method of work. The working out of his problems is entirely predicated upon a perfect die without which drawing problems become insoluble and bewildering.

✦ ✦ ✦

IT is a conceded fact that die yield is erratic. We have all at times owned a few dies which yielded astounding poundages of wire as compared to the average die.

✦ ✦ ✦

THESE freak yields are usually attributed to an exceptional quality of diamond. Yet we must admit that diamonds **now** used in this country, particularly in the making of fine dies, are very good so that if it were a matter of diamond quality our average yields should now come closer to the freak ones, which is not the case.

✦ ✦ ✦

IT is evident then that this difference is due to the quality of the workmanship and we know that good powder is the essential requisite for good workmanship.

✦ ✦ ✦

IN conclusion it can be stated that with powder of predetermined grain size;

1. **We have the element with which we can determine the ideal speed, tapping frequency and pressure on the needle as well as the required physical properties of the oil and so, can considerably lower the cost of a die and better its quality.**
2. **We can work out a satisfying technique for correct profile drilling.**
3. **We can obtain the high die polish which is essential to the production of high quality wire.**
4. **We can considerably lower the cost of production of the wire through better and cheaper dies.**

✦ ✦ ✦

I NEED not insist on how important this will be to die makers and wire drawers during the post-war struggle for survival.

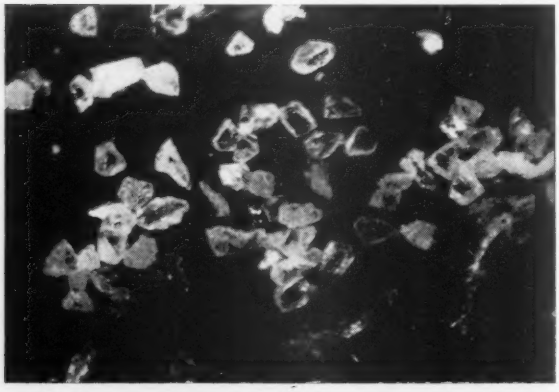

Fig. 1. Grain between mesh 200 and 325. Enlarg. 100X. Break up pattern of Brazil diamond, clear, brown and green, round shapes, sound quality, shiny skin. ✦ ✦ ✦ ✦

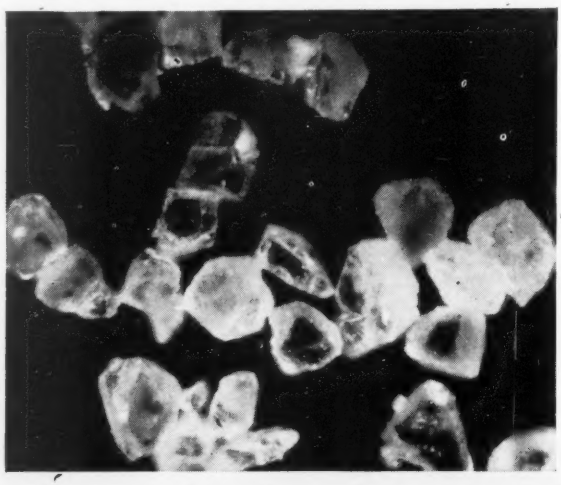

Fig. 7. Graded particles prepared on slide for measurement (mixed origins). Enlarg. 250X. ✦ ✦ ✦ ✦

What Are "Fine Diamond Powders"

POWDERS are called "Fine" when they can no longer be graded by sieving. They are thus "Sub-Sieve"; that is so small as to fall through the finest screens or wire cloth made.

✦ ✦ ✦

THE finest wire cloth manufactured is about "400 mesh". This means that there are 400 square meshes to a running inch. The size of each mesh is supposed to be, according to the standards of the Bureau of Standards and Weights, 37 microns between adjacent warp and the adjacent shoot wires.

✦ ✦ ✦

THIS however is deceptive. Diamond particles as we will see later are mostly shaped like irregular blocks with a length, width and thickness average ratio of about 6½, 4½, 3. so that a particle of proper contour about 60 microns in width and about 80 in length can fall through a 37 micron mesh diagonally.

✦ ✦ ✦

BESIDES, the irregularities in the weave and the overlapping of the warp and the shoot increase the discrepancy still further.

✦ ✦ ✦

IT is therefore obvious that screening is out of question for grading die powders even in the larger grain sizes.

✦ ✦ ✦

DIE powders from 100 microns down have heretofore been divided into 7 categories with intermediate numbers designated by fractions such as 5½ and 6½. This of course is an arbitrary division based on tradition and there is really no sense in perpetuating it. Powders should be labelled according to grain size in microns with an allowed and designated tolerance of plus/minus so many per cent.

What Do Diamond Particles Look Like (Fig. 1 and 7)

BORT used for crushing is as a rule cracked and impure diamond of all sizes or small sound diamond too dark in color or too small for either gem cutting or industrial purposes.

✦ ✦ ✦

AS any kind of impurities and inclusions (carbon spots and other types) amount to fissures in the crystal structure, the very first blows of the hammer quickly reduce the bort to small fragments of varied forms. Likewise small but sound bort will also be quickly reduced to fragments.

✦ ✦ ✦

WHEN these fragments are crushed further to fine grit, particles examined under the microscope will prove to be sound, free from cracks or color and assume the general pattern of a tetrahedron with most of the apexes blunted, rounded off or broken off in varying degrees. As a rule 6 faces can be made out, a few of them regular cleavage planes, the others conchoidal breaks.

✦ ✦ ✦

FROM then on, no matter how fine the grit is crushed, the general break-up pattern will remain the same.

✦ ✦ ✦

MOST particles are irregular oblong blocks with their dimensions averaging as 6½/4½/3.

✦ ✦ ✦

NEXT in numbers are the flat or long blocks, ratio 7/4½/2½ or any combination thereof with 7 as a maximum and 2½ as a minimum.

✦ ✦ ✦

THEN in much smaller numbers come the triangular shapes or tetrahedra with one apex broken off deep, parallel to the base.

WHEN the triangle is further reduced by the breaking off of one apex we obtain a needle. When the triangle is very flat it is a flake and broken flakes are slivers or points.

✦ ✦ ✦

TRIANGLES, needles, flakes, slivers and points are not numerous and their proportion by weight is negligible. Their nuisance value should not be exaggerated, because when squeezed between the revolving needle and the die they break up quickly before great harm is done.

✦ ✦ ✦

IT must be admitted that there is no uniformity in the shapes of the particles. Sharp edges and apexes can be ignored as far as their effect on grading and if we then visualize the particles with edges and points rounded off we find that the sphere is the geometrical form they resemble most.

✦ ✦ ✦

THIS is important and fortunate because the law governing the fall of small particles in a more or less viscous liquid, upon which we depend for grading, is based on spherules and can only be used by us if we suppose the particles roughly equivalent to a spherule when compared on a volume basis.

✦ ✦ ✦

EXPERIMENTS have shown that they behave as such.

✦ ✦ ✦

OF course flakes and needles as well as slivers and points must be considered in the light of their three dimensions for they necessarily have large lateral dimensions compared to the sphere to which they are equivalent in volume.

✦ ✦ ✦

HOWEVER, in their case, the **streamlining** plays a preponderant part as we will see later.

✦ ✦ ✦

Selection of Raw Material

THE mechanization of die making requires the use of **larger**

quantities of powder. The amount of powder used per size hole has risen so considerably that powder cost now represents a sizeable proportion of the die cost. Naturally the question of the selection of the bort for crushing must be raised. On that occasion the old fallacies about hard and soft diamonds according to their origin come to the fore again.

✦ ✦ ✦

ALTHOUGH the subject has been discussed in this journal it is well to reiterate that we have no knowledge either scientific or experimental which permits us to say that carbon atoms are bound together in varying degrees of strength according to the origin of the crystal.

✦ ✦ ✦

WE know that strains exist in stones of all origins due to various causes. Among the many are; impurities and elevation of temperature to which the diamond may have been subjected during its geological past.

✦ ✦ ✦

IMPURITIES or inclusions are not necessarily carbon spots or other macroscopic matters but may also be foreign elements present in a diffused state whether revealed by color or not.

✦ ✦ ✦

A recent and very thorough spectrographical analysis of the minor foreign elements in diamonds made by F. G. Chesley of the M.I.T. (published in the American Mineralogist) confirms that foreign elements are present in such small quantities that they can safely be ignored when diamond is used for crushing.

✦ ✦ ✦

ANYHOW, when one examines under the microscope powder made out of the lowest grade of diamond in their smallest identifiable grain size one fails to detect the presence of foreign matter except on rare occasions and then in infinitesimal quantity. It is therefore certain that what foreign elements there are must either be of submicroscopic size or else be evenly diffused within the structure of the fragments.

✦ ✦ ✦

IN all cases the actual weight of foreign matter is negligible.

✦ ✦ ✦

IT would therefore be indicated to use for crushing the cheapest diamonds obtainable.

✦ ✦ ✦

THERE still remains to clarify the situation as regards to bort said to yield an inferior quality of powder. All Congo bort is reputed to be inferior, presumably because some of the Congo diggings such as the B.C.K. yield considerable quantities of low grade bort without value for either gem cutting or industrial uses.

✦ ✦ ✦

IT is evident that stones riddled with impurities and cracks will not stand up when used for wheel dressers, wire dies or shaped tools regardless of their origin and **when crushed into powder they will break up quicker and be reduced to finer grain more rapidly.**

✦ ✦ ✦

THAT is why the many industries using large grains only (80 microns and over) will be disappointed if they crush that kind of bort. However, those who need powder for die work, that is mostly below 50 microns can get along very well with the Congo bort because by the time the fragments reach the 50 micron size, the microscope reveals them to be as sound and solid as if they had been broken down from the highest type of diamond.

✦ ✦ ✦

USERS are nevertheless cautioned against resorting to the extreme in using foamy, sandy and dull bort that breaks up into submicroscopic dust at the first blow of the hammer. This type is found among the Brazil and Jagersfontein diamonds as well.

✦ ✦ ✦

AS for salvage bort, such as is taken out of used drilling bits or any tool that has been subjected to high temperatures, the heat has undoubtedly altered the structure towards that of graphite and rendered it brittle as has been shown in the remarkable work on the graphitization of diamonds by Nagendrah Nath and others of the Indian Academy of Science.

✦ ✦ ✦

FIGS 1 to 7 show the microphotographs of particles of different types of diamonds from the finest clear round Brazilian gem stone to the lowest type of B.C.K. Congo bort. The pictures show grains selected out of countless fields as typical of their kind.

✦ ✦ ✦

THE visual scanning of a great number of fields of each sample showed conclusively that **the break up pattern of all diamonds irrespective of origin is the same after a certain grain size is reached. This is also true for the soundness of the particle. As for the break up pattern according to quality of diamond, the start of the normal break up pattern is only slightly delayed by poor quality and it is astonishing to see how the poorest types of bort finally break up to look identical to the finest.**

✦ ✦ ✦

WE are, in this paper, only concerned with powders for die work so that all other conclusions that can be drawn from this bort study can be momentarily left aside.

✦ ✦ ✦

The Crushing of Bort

THE most efficient method is still that of pulverizing bort in the old fashioned way by steel pestle and mortar.

✦ ✦ ✦

WHEN only small quantities are involved, crushing by hand-hammer blows is ideal. The mortar is placed on a lead slab which rests upon the knee and is firmly gripped in the lower part of the left hand. The mortar must have a cover or cap that can be screwed on tight, with leather

Ungraded Particles
Identical Crushing Conditions

Fig. 2. 250X. From ½ carat Congo diamond bort heavily zoned black dull piece.

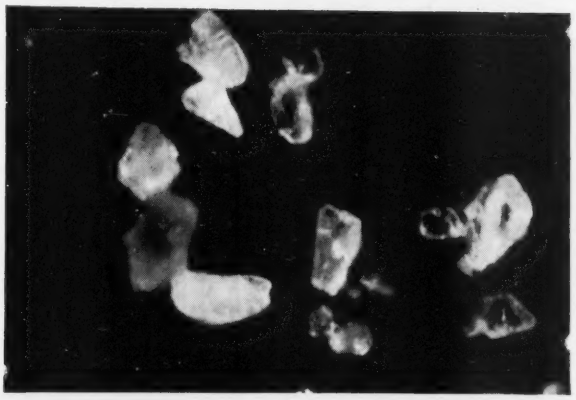

Fig. 3. 500X. From 8 p. c. West Africa diamonds clear, shiny skin, round white with carbons.

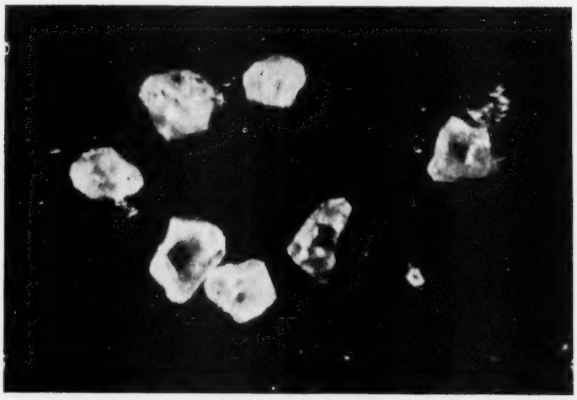

Fig. 4. 500X. From large Congo diamond bort. Dull grey-black slaty appearance.

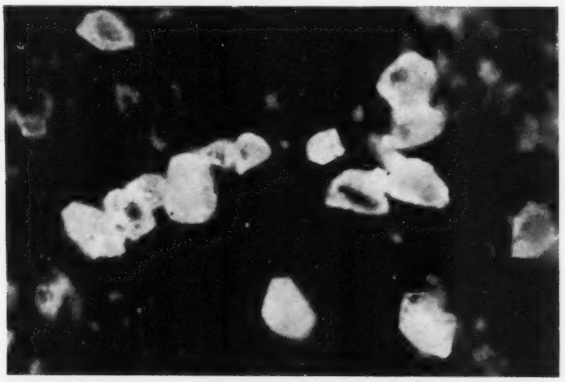

Fig. 5. 500X. From 9 p. c. West Africa diamonds clear brown, shiny skin, roundish.

washers to keep the fine powder from being blown out. The pestle is pressed downward between the left index and thumb and given an eighth of a turn after each series of blows; this keeps it from acting as a piston and blowing the fine powder out of the mortar, while the periodic turn will prevent the powder from conglomerating thus slowing the operation.

✦ ✦ ✦

THE hammer should be of such weight as to permit a rhythm of about 200 blows a minute.

✦ ✦ ✦

BEST results are obtained by first reducing the entire lot of bort to fragments in quantities of 15/20 carats at the time and by a few series of strokes. The breakage is then thrown into a sieve through which only die powder grain sizes fall. This sieve should be of the type known as round-hole plate screen with a sturdy frame to permit forceful shaking.

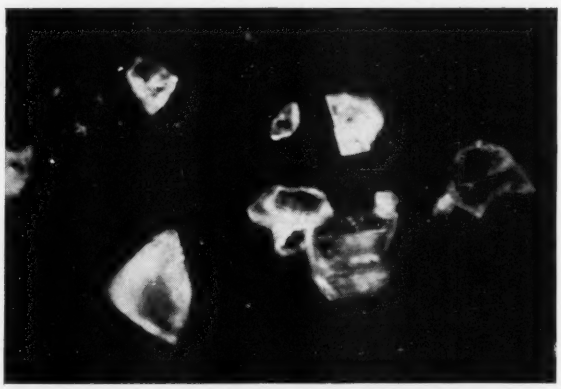

Fig. 6. 500X. 12 p. c. Bahia Brazil Diamonds. Black, green, brown, round, sound.

✦ ✦ ✦

THE second crushing is done with only 5 to 7 carats of grit at the time (for a mortar of 1 inch bore) otherwise the powder will aggregate and crushing is slowed down.

✦ ✦ ✦

THE crushings are thrown back into the sieve and that which still is oversized is crushed again.

✦ ✦ ✦

WHEN large quantities (thousands of carats) are required

at regular intervals a mortar with a larger bore is used and it is advisable to mechanize the operation. The hammering is then done by power and has the advantage of being continuous.

✦ ✦ ✦

VARIOUS types are in use, mostly self-made devices. Net losses in weight are higher than by hand crushing but the loss must be weighed against the labor saving.

✦ ✦ ✦

THE success of motor driven crushing will depend entirely upon how efficiently the human features of the pestle and mortar method have been mechanized.

✦ ✦ ✦

THE first fragmentation is at times done by steel rollers. Another system used is that of the jar mill. Steel jars containing steel balls are rotated by motor. These methods have the disadvantage, among others, of leaving steel particles in the powder. It requires an additional operation to eliminate them.

✦ ✦ ✦

SO far the pestle and mortar method has proven best.

✦ ✦ ✦

Selection of a Grading Method

THERE are three methods for grading sub-sieve powders. All three are used in many ways in industry or in the laboratory for grading a great variety of materials.

✦ ✦ ✦

The First Method Is That of "Airflow"

PARTICLES are blown out of an oscillating container through coned chambers of varying diameter and height into collectors. The heaviest particles are collected first. The rate of air flow is controlled by a calibrated flowmeter.

THIS method thus separates by air current overcoming gravity. The result will be affected by air pressure as well as by moisture. True some apparata are available to correct almost all forms of variable factors but this is adding extra complications. Most commercial apparata claim flowmeter control to within ± 5%.

✦ ✦ ✦

The Second Method is That of "Fluidflow"

THE general principal is much the same as in method 1. A flow of liquid carries the lighter particles through several cylinders of different diameter at a given velocity leaving the heavier ones to settle in successive collectors. The flow can be regulated.

✦ ✦ ✦

THE diameter of the cylinders, the effects of friction in the cylinders and piping, the viscosity and the density of the liquid as well as the temperature must all be taken into account. This method thus grades through the velocity of the liquid flow overcoming the effects of gravity.

✦ ✦ ✦

The Third Method Is That of "Sedimentation" or "Decantation"

I PREFER "Decantation" because it implies the pouring off gently of the liquid containing the particles which did not sink to the bottom. In this case we deal only with viscosity and density which act as a force resisting the effects of gravity.

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THE temperature also plays a part, but this is easy to regulate when handling but one vessel without piping, at the time.

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WE have at our disposal a great number of liquids with suitable density and viscosity to accelerate or retard the fall of the particles at will.

COMPARING the merits of the three methods we find that in the Decantation method **each grain size collects at the bottom undisturbed by variable factors difficult to control.**

✦ ✦ ✦

IN both air and fluidflow the largest particles are held back by gravity while the smaller ones overcome this effect by being forcefully blown or washed away. Any irregularity in air or liquid flow will carry large particles into the collector of small ones. Therefore, while it is fairly easy to obtain even grain sizes in the larger diameters, by prolonging or repeating the operation, it is more difficult to get uniformity in the finest ones where it is essential.

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WE must bear in mind that diamond particles are odd shaped so that they are more apt to disregard the laws of hydrodynamics and aerodynamics than they are to warp the simple effects of viscosity, so much the more; that diamond with its well known affinity for fats, if decanted in oil, will cover itself with a film of oil and act as a heavier molecule of the oil thus behaving in an orthodox manner.

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FURTHERMORE, while the effects of viscosity are constant and predictable artificially created airflow or fluidflow are erratic and subject to friction and to currents and many other phenomena not thoroughly understood, so that the particles must be expected to behave erratically.

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NEVERTHELESS, I would not discourage anyone from trying their luck at the first two methods as there may be someone somewhere who may find a better approach to the problem and get good results. I propose, however, to offer some suggestions to those who wish to get results with the

(Please turn to Page 516)

The Foreman's Part In Better Labor Relations

By O. C. Cool,
Director, Labor Relations Institute, New York, N. Y.

A VERY wise employer told me the other day, "We have never encountered a single instance of labor trouble which could not have been prevented if we had had the right kind of foremen on the job. We see now that the way to prevent *future* situations is by selecting foremen who can lead as well as boss—and who can live up to the management and labor relations responsibilities which go with their title."

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I AGREE with him a thousand per cent. Show me *any* plant where the foremen really perform the functions which belong to their job—and perform them well—and I will show you a trouble-free plant. One reason it will be trouble-free is that uniform high-quality foremen don't "just happen"; having skilled, properly-trained, competent supervisors throughout the works is a desirable goal that can be attained only as a result of sound management policy. And when it comes to the selection of foremen, the average company just hasn't any policy. Instead of regarding foremanship as a specialized branch of management, the average firm appoints its foremen on wholly irrelevant grounds. "Tim Smith has been with the company for 23 years. Make him the foreman." Or, "Bill Jones has been the top producer in that department since the war began. He's the man to promote to foreman."

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I CALL these factors irrelevant because being a faithful workman or a marvel of production efficiency has practically nothing to do with being a good foreman. Some of the best foremen in industry today never worked in a factory before Pearl Harbor, and not all of these possess more than average mechanical ability. What do they have that the hard-boiled foremen of the old school lack? For one thing, they have foremanship ability — and were chosen for that reason. For another, they have been trained to become foremen, and they regard their position as a special craft—almost a profession. They take pride in their four-fold relationship to the workers in their charge, serving them as (1) instructor; (2) director; (3) interpreter and (4) friend.

✦ ✦ ✦

THE successful foreman appreciates the true significance of *morale* as a production factor. In carrying out the major duties enumerated above, he treats the workers in his charge as human beings with rights and dignities and privileges—regarding himself as their leader rather than their boss. He would score at least 400 in Glenn Gardiner's famous test, in which 100 is given for an affirmative answer to each of the following questions:

1. **Do you know and call each worker by his first name?**
2. **Do you know the marital status, number of children, years of schooling and at least one outside interest of each worker under you?**
3. **Do you always ascertain a worker's viewpoint before making a decision affecting his interests?**
4. **Do you always give full credit for the worker's ideas and suggestions?**
5. **Do you get more satisfaction from praising workers than from "bawling them out"?**

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TO the old-type foreman these questions would smack of molly-coddling — on the tender side rather than the tough, and therefore just another silly notion of management. But one big company—**Western Electric**—made a test which actually proved that the *attitude of the foreman* is the basic fundamental of good working conditions. This firm took a group of employees and surrounded them with everything that could make their duties pleasurable—and discovered that pleasant physical surroundings, perfect lighting, fine toilet facilities, rest periods, snacks during work hours, etc., really increased output very little. But when the emphasis was shifted to *improving the nature of the supervision*—how the workers got along with the foreman, whether they were treated equally and praised for doing good work, production soared. In short, you can modernize a plant all you please, but it will do little good if the foremen still live in the Middle Ages.

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THERE are other proofs that quality of supervision is of top-flight labor-relations importance. **J. David House,** for instance, demonstrated through testing that employees in general rate their wages *seventh* in a scale of values. They put the following six points ahead of the weekly pay-check:

1. **Receiving help necessary to get results expected by the management.**
2. **Being encouraged to offer suggestions and try new methods.**
3. **Being told whether their work is improving.**
4. **Certainty of getting a fair hearing and a square deal for grievances.**
5. **Certainty of promotions going to those who are best qualified.**
6. **Being encouraged to seek advice.**

WITH the help and encouragement of management, every foreman can go a long way toward realizing the ideals expressed in these tests and surveys. An effective way to do it is through the 4-point formula, which helps the foreman to embrace the full range of his responsibilities, both to the company and to the employees in his charge.

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1. The Foreman As An Instructor

BOTH in "breaking in" new employees and in preparing others for promotion to higher jobs, the foreman's function as an instructor is of key importance. Every worker wants to be employed at his highest skill, not only because of the higher earnings involved, but also because of the tremendous factors of self-respect and respect from fellow-workers. The foreman or supervisor who patiently trains the members of his department, avoiding "show-off" tactics and patronizing gestures, is bound to win cooperation from his staff.

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ONE of the fundamental mistakes in training is to assume that the new worker knows more than he really does about the particular operation, machine or material. Another basic fault is impatience on the part of the instructor, who, because the task is easy for him to do, expects the novice to grasp everything at once. Time spent in explaining complete details, in demonstrating, step by step, the task to be performed, is time invested. But there is no "pay-off" unless the worker fully grasps the teaching, and this means that the instructor must watch the learner do the job "on his own". It also involves constant, but friendly, checking up throughout the first day or so of work, to be sure that everything is fully understood. Allowance must be made for nervousness on the part of the beginner, and this explains why the foreman's instructing should be done in a manner which puts the new man at ease.

OF course, instruction is not confined to the actual task to be performed by the new workers. Every job is surrounded with details, such as how to get materials or tools, what to do if the machine breaks or needs adjustment; what the rules are regarding rest periods and relief; safety practices and regulations; checking in and checking out, etc. In the well-ordered shop, such details will be covered in the Employees' Manual or handbook given them upon induction, but the foreman who takes his responsibilities as an instructor to heart will not be content to let the new worker get it all from the book. Instead, he will discuss these points in his own way, using the manual more as supplementary text or for illustration. This treatment insures that the manual will be referred to, and not be regarded as so much "fine print". And if the manual doesn't lend itself to this practice, you need a new manual.

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2. The Foreman As Director

NATURALLY, foremanship goes beyond instruction, which, after all, is a means toward an end. That end is sustained production at the minimum cost in money, time, material and effort. Quality is also an essential factor; it does no good to step up the production of parts if the percentage of rejects also rises. Wear and tear on workers is as costly as wear and tear on machinery: the good foreman develops a faculty for sensing what can and can not be done, so far as pace is concerned.

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THE ability to weld the individual workers into a team which functions smoothly as a unit is a touchstone of good supervision. This means that the foreman must have a harmonizing influence on the people who work under him. He cannot afford to ignore feuds or differences of opinion which lead to petty strife and bickering between the employees. Without offensively sticking his nose into other people's business, he must smooth out such tangles and irritations — or, if he finds that impossible — see that the inharmonious elements are transferred to other departments or other shifts. The practical jokers and the horseplay addict must be disciplined or separated, and the chronic complainers either satisfied or firmly dealt with (as must be done if their gripes are imaginary or unreasonable). The distinction must be drawn between the "natural-born fault-finder" who gets in other workers' hair and the employee with a sincere grievance.

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MUCH of the literature on foremanship overlooks the foreman as an administrator who must deputize and delegate as well as directly supervise. The foreman who has to do everything himself, for fear that nobody else can handle it quite as well as he, is in as bad a position as the top manager who makes everything clear his own desk.

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3. The Foreman As Interpreter

THE foreman is a part of management, and a very important part, at that. He, more than anyone else on the management side of the organization, comes into daily — even hourly — contact with the employees. In fact, to most of the workers the foreman is the management. Upon his shoulders falls the burden of humanizing and interpreting the various company policies which affect the employees. He is more than mere liason officer, however; in nine cases out of ten his decisions are final, and while these decisions obviously must conform with company policy, they are the foreman's own actions, taken on his own authority and responsibility. The body of these decisions tend to be regarded as company policy as time goes on. So the foreman's acts, as well as his words, ultimately reflect "the Company" to the workers.

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FOREMAN-interpretation involves not only the explanation of company policy towards days off, minor infractions of rules and similar matters, but also the much higher type of action involved in handling grievances, when the fore-

man acts quasijudicially. The measure of a foreman's capacity could well be his reception of complaints — whether he meets the employee half-way and tries to settle the matter equitably, or whether he resents the complaint as a reflection upon his own ability. To be fully effective, and to get the best results from the grievance machinery, the foreman should not merely **settle** complaints — he should invite them. The worker who finally speaks his mind must feel that the expression is well within his rights, and that no retaliation or discrimination will result. That is why the foreman hearing the complaint should lean over backward to assure the employee that he is listening to every word, and that all aspects of the matter are being given full consideration — with the employee's interest uppermost in the foreman's mind.

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SOME foremen dismiss the need for grievance systems by saying. "There isn't a man in my department who can't come to me and say anything he pleases." But they rob a grievance of its significance by being too casual about it. In short, they are acting as Bill Smith or Bob Jones instead of as management representatives. The good foreman is neither casual nor sarcastic in his dealings with his force; when faced with a serious complaint (and every complaint is serious to the complainer) his demeanor suits the occasion.

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4. The Foreman As A Friend

EVERY progressive management wants to be considered the friend of all the workers, but it is obviously impossible for this to be literally true in all but the smallest companies. But the foreman, who is a part of management, certainly can be the friend of every worker in his department. He is the one person who knows everybody, and he can be either the amalgam which unites the group or the obstacle which keeps everyone apart. He is the one who sees when employees need help or counsel; if he is friend as well as foreman they will bring their troubles to him. He works with them and fights for them, and is combination counsellor and champion as the case requires.

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THIS does not mean that the foreman should be too hail-fellow-well-met, or that he should feel it incumbent upon him to treat his subordinates as social companions. The distinction in rank should always be apparent, at least in the shop. The foreman who weakens his authority and prestige by needless fraternizing is no more a friend thereby — and certainly less of a part of management. The Golden Rule is a surer foundation for friendship than trying to be "pals" with everybody.

✦ ✦ ✦

Foremen Have Grievances, Too

ONE of the reasons why all foremen aren't measuring up to the standards named above is an indifference to their morale on the part of higher management. It is not exaggerating to say that in many companies the foreman has become almost a Forgotten Man. An investigation into the problem by the Field Staff of the Institute proved that many firms have been neglecting the fundamental rules of good foreman-employer-employee relations. Here is the gist of the foremen's complaints, plus the Institute's recommended treatment:

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COMPLAINT: "Other departments cut into our functions too frequently. As a result, we face lost prestige in matters which should be in our own domain."

Solution: Restore the foreman to his true function as the first line of personnel authority. Give him the right to approve new workers and suggest the discharge of any employee. Make him the first person to whom a grievance can be brought for settlement. When an appeal brings a reversal, let the foreman himself tell the employee. Consult the foreman in all questions pertaining to the earnings or transfer of workers in his department — and, above all, let your foremen know the extent and limitations of their authority.

✦ ✦ ✦

COMPLAINT: "We are supposed to be part of management, but we never know what management is thinking or planning."

Solution: Don't make it necessary for foremen to read the bulletin board in order to learn about the new rules. Always hold foreman conferences before making any substantial changes in company policy. Have the foremen, themselves, announce changes in company policy to their workers. If you use departmental bulletin boards, have all company notices signed on the bottom by the foreman of the department. Notices should instruct workers to ask their foremen for further data or explanations.

✦ ✦ ✦

COMPLAINT: "We share in the extra burdens of management, but our wages are not in keeping with the position we are supposed to enjoy. In some cases, workers under our supervision earn more than we do."

Solution: No foreman should receive less than 10 percent more than the highest-paid worker beneath him. A margin of 15 to 25 percent is even better. File with the Treasury Department for permission to restore these pre-war differentials in pay, pointing out that because of longer hours or greater responsibility the foremen are earning less proportionately. You can also file for a foremen's incentive plan, and at the same time can apply for permission to put the foremen on a salary basis, and to give them longer vacations and sick leave with pay.

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COMPLAINT: "We are supposed to be apart from the rank and file, but we get no distinctions in treatment that make this apparent to the workers."

Solution: The foreman should have a visibly distinct status in the eyes of the labor force. Hence the value of separate (not necessarily better) facilities for fore-

(Please turn to Page 516)

Electric Equipment For Wire Drawing Machines

By A. L. Thurman,
Industrial Engineering Division, General Electric Company,
Schenectady, N. Y.

PART II
Tensiometers on Wire Drawing Machines.
Build-up Reels — Electric Reel Drives — Thyratron Control.
Published August 1944

PART I
Electric Equipment for Wire Drawing Machines.
Published July 1944

Tensiometers On Wire Drawing Machines

THE General Electric Co., recently furnished an adjustable voltage drive for a six-block wire drawing machine, each block of which is driven by a 15 HP, 345 volt motor. Open floor mounted control panels were furnished, with all panels forming a single structure as shown by Fig. 6. The motor starter for the 60 KW motor-generator set is located on the right side of the panel. Figure 7 shows a rear view of the same panel lineup. The equipment was "factory assembled" with the starting autotransformer for the M-G set motor, all dynamic braking resistors, and the motor-operated rheostat for speed selection completely wired to the panels.

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ALONG with this equipment, the Company furnished five tensiometers for measuring the back tension in the wire as it enters the last five dies. These tensiometers were furnished to enable the operators to determine quantitatively the effect of back tension on the wire product, by actually measuring back tension with wire.

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EXPERIMENTAL data indicates that die heating is the result of:

1) **Heat transmitted from the wire to the die as the result of the work done to overcome molecular friction in reducing the diameter of the wire, and**

2) **Heat generated by sliding friction between the wire and the die surfaces.**

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EXPERIMENTAL data has further shown that appreciable reduction in die heating can be obtained by holding a given back tension at given wire speeds. As die heating is the principal limitation on wire drawing speed, decreasing die heating by means of back tension should make possible higher wire speeds.

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WITH suitable regulating equipment, the tensiometers can be used to hold a given value of tension on the wire automatically, as in the operation of a tandem cold strip mill. This type of control would eliminate the need for a dancer-roll rheostat since an amplidyne regulator control could receive its signal from the tensiometer to hold a given preselected

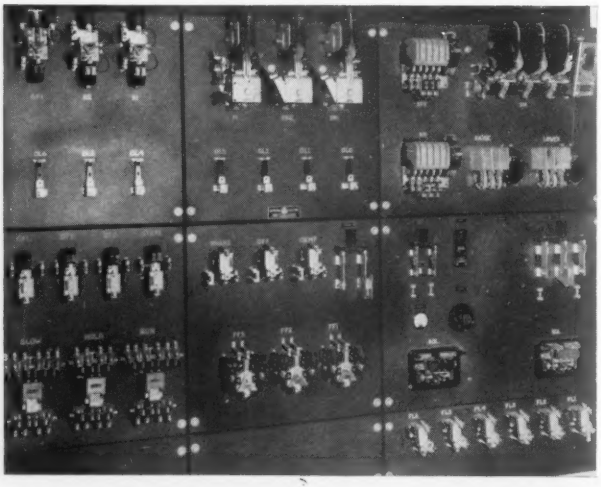

Fig. 6. Open floor mounted control panel for D-C adjustable voltage 6 motor drive for multi-block wire drawing machine. ✦ ✦

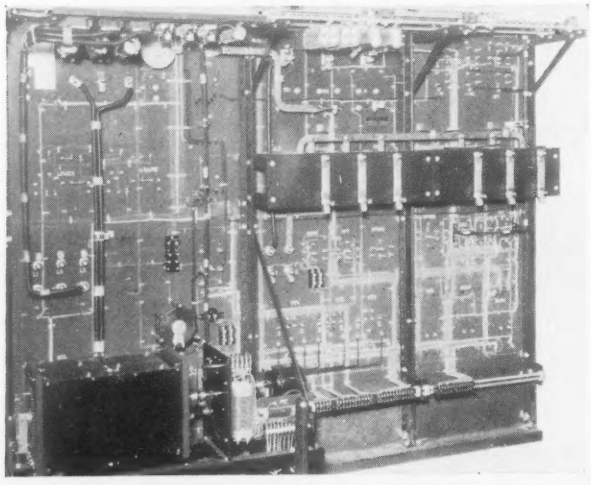

Fig. 7. Back view of panel shown in Figure 6 illustrating L-type frame work factory assembled construction. ✦ ✦ ✦

value of tension by controlling the speed of the capstan motors which applies back tension to the wire.

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WITH this equipment as furnished, however, the tensiometers are used merely as tension-indicators, from which the operator will be able to adjust his machine for maintenance of the optimum value of back tension. In normal operation the only means which will be provided on the machine for adjusting back tension is the adjustment of the spring tension applied to the rider arm operating the speed adjustment rheostats for the various capstans.

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THE tensiometer unit is built integral with the support for the guide sheave. Back tension in the wire through the range of from zero to maximum is measured with practically no movement of the guide sheave. Five indicating meters, electrically operated from each of the five tensiometer heads, provide constant indication of wire back tension.

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AS a means of obtaining the actual pull in the wire as it is drawn through the die (or "front tension"), meters are provided for measurement of the power input to each motor. With a suitable allowance for friction, the die pull can be approximately determined, and the ratio of die pull to back tension obtained.

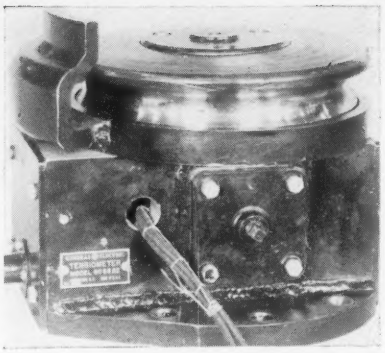

Fig. 8. Side view of tensiometer especially designed for wire drawing machine. ✦

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A PHOTOGRAPH of this unit is shown by Fig. 8. The tensiometer unit is approximately 12″ long x 10″ wide x 10″ high. It is therefore small enough that it can be mounted as an integral part of the wire drawing machine.

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THIS tensiometer works on the same principle as the tensiometer unit commonly used in tandem cold strip mill operation. Fig. 9 shows two schematic diagrams of a tensiometer unit, the left in a zero tension position and the right in a position to indicate a definite value of tension. The unit is an electric gage of the transformer type, having a primary and two secondary windings in each coil. The primary windings (P1-P2) are connected to a constant 115 volt, 60 cycle power supply. With the air gap at the two ends of the armature equal, the electrical energy output from the secondary winding of the detector unit is zero. With the left air gap decreased and the right increased due to the downward force on the pass roller, a current will flow in the secondary circuit that will be proportional to the deflection of the armature. This current is rectified by the use of copper oxide rectifiers, and the d-c current is metered to give an indication of tension. When used to hold constant tension, the current output of the tensiometer is the signal to the regulator.

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Applications

WIRE drawing machines are most widely used in the Steel and Copper industries, although a large amount of Aluminum wire was being produced before the War.

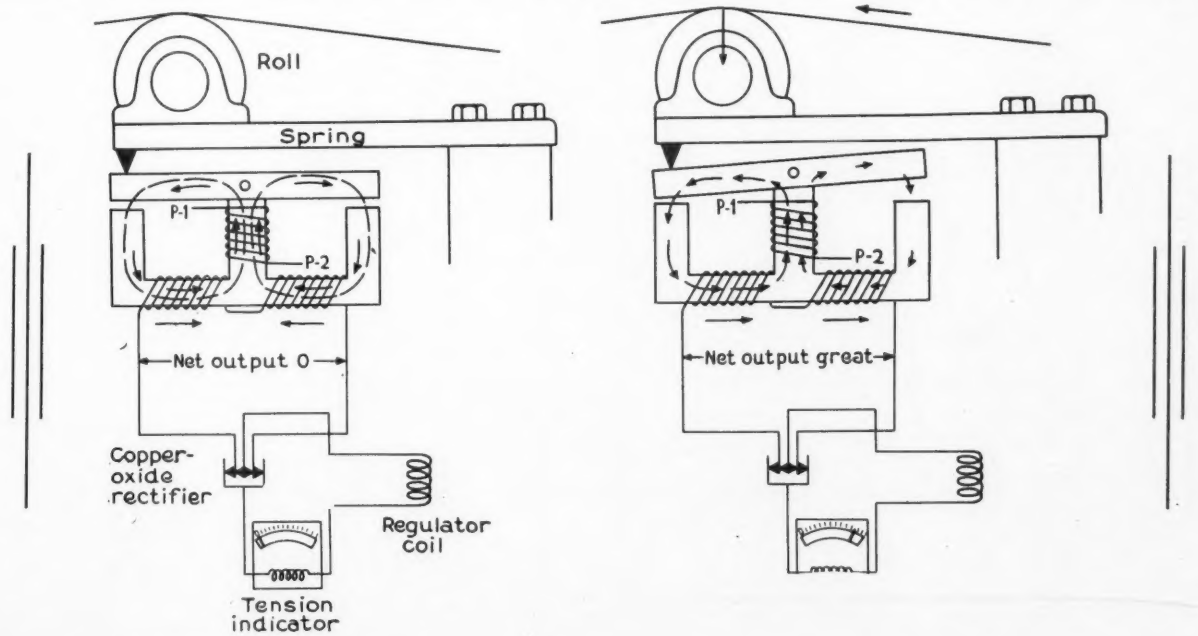

Fig. 9. Schematic diagram of tensiometer. ✦ ✦ ✦ ✦ ✦ ✦ ✦

THE principle difference in drawing steel and copper wire is that very little slippage is permissable in drawing steel wire. Copper wire is soft and does not tend to groove the drum, and with the lubrication used, the wire is not overheated or "burned." Slippage on a steel wire machine will soon groove the drums which would then require resurfacing, and slippage tends to "burn" the wire. For this reason multipass machines for drawing steel wire are either of the semi-continuous type, which provide storage between passes, or have individually driven drums with means for automatic adjustment of drum speed to the proper value. The upright cone type machine is most commonly used for copper drawing.

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THE principle limitation in drawing speeds is die heating; thus drawing speeds for copper are usually higher than for steel. Medium and heavy copper wire is drawn at between 2500 and 3500 fpm, while fine wire is drawn at between 4000 and 4500 fpm. Copper rod ¼" in diameter may be reduced to #16 gauge in 13 passes in one machine at about 3500 fpm output speed.

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MEDIUM and heavy steel wire is commonly drawn at between 1200 to 1400 fpm, and some machines draw at 2500 fpm. #5 gauge steel wire can be drawn down to #16 gauge in 6 passes.

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Build-up Reels

SEVERAL methods have been used for controlling build-up reels. Small machines are sometimes provided with slip clutches, either spring or air operated, and as the reel diameter increases throughout the reeling of one coil, the clutch slips more and more allowing the reel speed to decrease. Some types of air operated clutches have been provided with throttling valves, controlled by dancer rolls riding in a loop of the wire, thus maintaining approximately constant tension. Slip clutches have performed satisfactorily for handling fine wire, but for heavier wire maintenance costs are high. Unless a means is provided for adjusting the clutch pressure as the reel diameter builds up, the clutches do not maintain an accurate setting, and at best hold constant torque on the reel shaft, and not constant tension in the wire.

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MAGNETIC clutches have also been used to provide a means of speed change for reel drives, but some means of control must be provided if constant wire tension is to be maintained.

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ON other small machines, reels are driven by a belt in contact with the wire on the surface of the reel, and such drives automatically compensate for reel build-up. Cone pulley drives for the belts provide means of changing the reel speed to accommodate different delivery speeds.

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A CONSTANT tension reel drive can also be obtained by use of a variable pitch pulley drive, where the pitch of the pulley is varied hydraulically by a dancer-roll mechanism. While this type of reel drive, as well as other similar types, may perform their desired functions, they require frequent servicing and are usually expensive.

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Electric Reel Drives

AS on strip mills or strip processing lines, the proper electric drive is the best available for build-up reels. The economics of the application must always be considered, however, and a compromise to the ideal is sometimes used. For instance, a squirrel cage induction motor with a high resistance rotor has been operated over speed ranges such that the speed-torque characteristics approximate a constant HP curve. Different characteristic curves for holding different values of tension are obtained on the squirrel cage motors by changing taps on an auto-transformer supplying the motor.

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WOUND rotor induction motors can be controlled in the same manner, but tension control is usually obtained by changing the secondary resistance.

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PRIMARY saturable reactor control has also been used on wound rotor induction motors for reel drives. This type of control has the advantage that changes in ten-

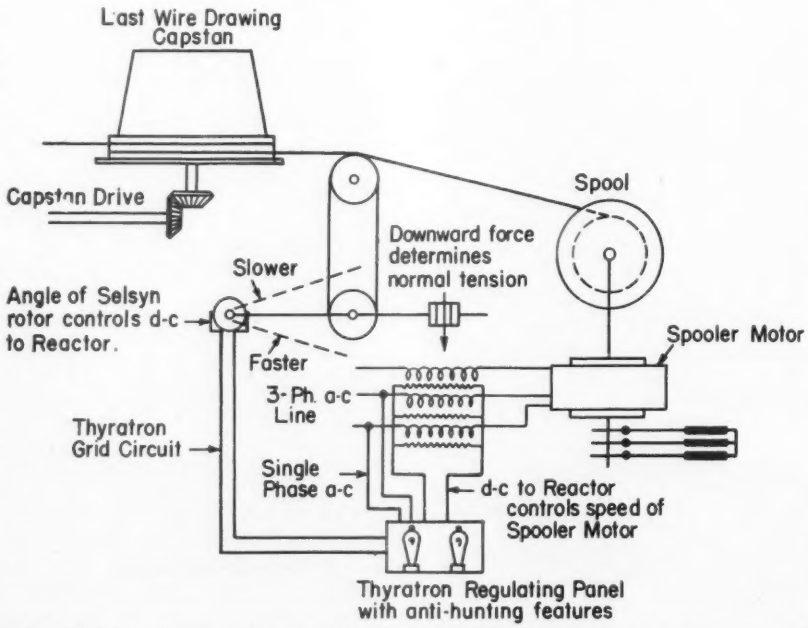

Fig. 10. Primary saturable reactor control for A-C wound rotor induction motor reel drive.

sion are easily and quickly made merely by changing a small value of d-c current on the saturating winding of the reactor. Figure 10 shows one scheme of saturable reactor reel control. For starting or adjusting, the d-c circuit can be controlled manually. The selsyn can be replaced by a reactor, or any other device which will control the grid bias on the thyratron tubes.

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D-C series motors have also been used for small reel drives where the external series resistance is varied to give different values of tension. The characteristic curve of the series motor closely resembles the speed-torque curve required by the build-up reel drive, assuming that the series motor is operating on exactly the right portion of its characteristic curve. When an attempt is made to regulate tension for a given wire speed, the variance from constant tension is increased as the series resistance is increased, since the curve tends to flatten out, particularly at low speeds. The actual curvature of the characteristic is changed considerably with little change at the light load or high speed point and with appreciable change at the heavy load or low speed point. For high values of series resistance, the motor characteristic tends to approach constant torque.

✦ ✦ ✦

THE above types of electrical drives are simple and inexpensive and may be satisfactory for many applications, but they have several objectionable features:

1) **They are not very flexible. The range of tension and speed at which they can be operated is limited; to obtain the correct characteristics for different delivery speeds, the gear ratio should be changed when the speed change is appreciable.**
2) **It is difficult to provide in these drives the additional torque necessary to accelerate the reel and motor rapidly as the machine comes up to speed; this necessitates either very slow acceleration of the main drive or a considerable loss of tension during the accelerating period, or both.**

✦ ✦ ✦

TO assist in obtaining speed matching during acceleration and deceleration, over-running clutches driven by the main motor are sometimes provided to accelerate the reel to a speed corresponding to the full reel diameter.

✦ ✦ ✦

CAREFUL consideration should be given the choice of the block drive when the machine is to have a reel drive. Unless an over-running clutch is used, the acceleration and deceleration of the main drive and reel must be reasonably matched to prevent wire breakage, regardless of the type of reel drive used. For instance, a squirrel cage induction motor should not be used on the block drive, as it is difficult to control the accelerating rate of the main drive to permit speed matching with the reel drive during starting or stopping.

✦ ✦ ✦

WITH any reel drive it is almost invariably necessary to provide a storage loop preceding the reel. Operation without a loop may be possible if the wire to be reeled is not too small, and a suitable type of adjustable voltage control is used for both the main and reel drives.

✦ ✦ ✦

WHEN suitable means are provided for bringing the main drive and the reel drive up to speed together, and when a storage loop is available, a dancer-roll rheostat may be used to control the field of a shunt wound d-c motor to maintain constant tension as the reel builds up. For small sizes of wire, thyratron reactor control can be used in conjunction with a dancer-roll mechanism. Very little force is required for operation of the thyratron solenoid. As a comparison, only about 0.5 inch pounds of work are required for full control of the thyratron solenoids, while about 40 inch pounds are required for full control of a 12″ dial dancer-roll rheostat. Figure 11 shows an installation of a thyratron reactor reel control, with both pay-off and winding reel on one end of the machine.

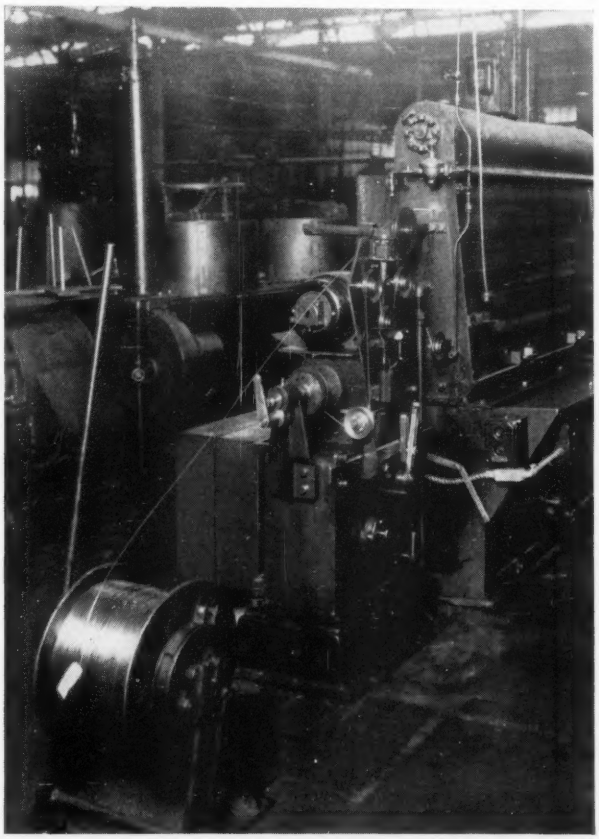

Fig. 11. Upright cone type wire drawing machine with thyratron reactor type winding reel control.

✦ ✦ ✦ ✦

✦ ✦ ✦

FIGURE 12 shows a schematic diagram of a thyratron reel control. Constant tension corresponding to one-half of the weight W, is maintained in the wire. Movement of the iron plunger in the control solenoid gives a control signal to the thyratron grids for controlling the d-c motor field current to provide correct motor speed for constant wire tension. For high wire speeds, a greater storage loop must be

available and it is therefore necessary to provide a lever arm for operation of the control solenoid, rather than by the direct action method shown by Figure 13.

✦ ✦ ✦

IN reeling very fine wire at high speeds great care must be used in both the mechanical and electrical design of the reel drive. Such a small amount of tension can be tolerated in the wire that the controlling mechanism must be carefully designed to make it sensitive enough to follow the necessary speed changes and still not be so sensitive that excessive hunting will occur. The power required to reel the wire is small in comparison to the friction load of the drive and constant horsepower output from the reel motor therefore does not provide constant wire tension; a carefully designed dancer roll mechanism can be used, but care must be used to match the reel and main drives during starting and stopping.

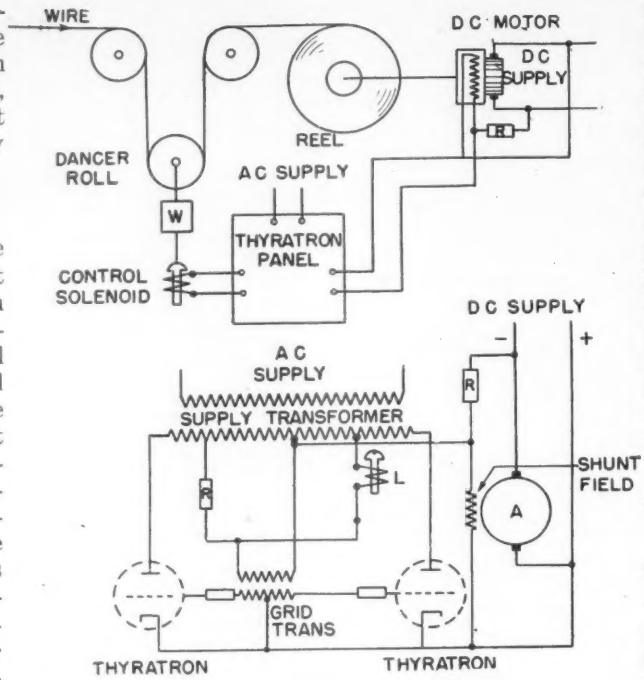

Fig. 12. Schematic diagram of thyratron reactor reel control.

AN improvement on the above thyratron control scheme has recently been applied to various types of reel drives. Thy-mo-trol drive provides in addition to the features available in Thyratron-reactor control: controlled forcing during acceleration; anti-hunt control can be easily provided; and current regulator control is available throughout the operating speed range. If the wire is large enough and reel build-up is not too great, the reel motor will usually be provided with sufficient speed range by field control to provide constant horsepower and therefore constant wire tension over the reel build-up. This type of drive offers promising possibilities, but as with any wire reel drive the problem of starting and stopping with the main drive must be solved.

✦ ✦ ✦

THE reel drive now used with high speed tandem cold strip-mills, the amplidyne reel drive, offer ideal characteristics for wire winding reels. Flexibility and ease of adjustment make this type of control readily adaptable to the many different requirements of wire reel drives. Each application should, however, be given careful study to assure that all operating requirements are provided for in the overall design of the main and reel drives.

IN 1944 THE

ANNUAL CONVENTION OF THE WIRE ASSOCIATION

will be held in

PITTSBURGH, PA.

WITH HEADQUARTERS AT THE WILLIAM PENN HOTEL

The Time: OCTOBER 16th to 19th, inclusive

The Convention at Pittsburgh will have all of the regular features, plus some added advantages not heretofore possible. A technical program of unusual interest has been arranged by the Program Committee, and everything points to this being the finest Convention offered our Members in our fourteen years of meetings.

FOR ADDITIONAL INFORMATION WRITE TO

THE WIRE ASSOCIATION

RICHARD E. BROWN, Executive Secretary

300 MAIN STREET STAMFORD, CONN.

Make your plans now to attend and send reservations early.

✦ GOVERNMENT WIRE PRODUCTION INFORMATION ✦

Warehouse Deliveries Of Wire Mill Products Cut 25% Below First Quarter Levels

EFFECTIVE July 1st, total deliveries of all copper wire mill products from warehouse stock on orders bearing C.M.P. allotment symbol "V-3" will be reduced approximately 25% from deliveries reported for the first quarter, W.P.B. announced.

✦ ✦ ✦

THE directive is necessary, W.P.B. said, because the demand for copper wire mill products under C.M.P. regulations No. 9 and No. 9-A has proved to be in excess of the supply available for the purpose of these regulations.

✦ ✦ ✦

ALL copper wire mills and copper wire mill warehouses that have been assigned company numbers are being directed to reduce their "V-3" deliveries on the same basis.

✦ ✦ ✦

THE directive was issued pursuant to paragraph (i) of C.M.P. Regulation No. 4.

✦ ✦ ✦

C.M.P. Regulations Nos. 9 and 9-A have made it possible for retailers and repairmen to obtain copper wire, cable, and cords to take care of necessary civilian repairs, the directive stated. They eliminated the necessity of a civilian user being required to file an individual application with W.P.B. for his needed requirements of this material.

✦ ✦ ✦

COPPER wire, cable and cords, the directive pointed out, are critical materials. Every effort is being put forth to see that they are used only where most urgently needed to maintain our wartime economy. Production of copper wire mills, and their available manpower are being entirely utilized to that end.

✦ ✦ ✦

Screw Advisory Committee Advised on Excess Stock Disposal

EXCESS Government owned stocks sold by the Treasury Department Procurement Division should be disposed of through regular trade channels on regular trade terms, members of the Machine, Wood and Sheet Metal Screw Industry Advisory Committee recommended at their recent meeting here, the War Production

(Please turn to Page 494)

MICROMETER PRECISION MICRO-WELD TRADE MARK REG. U. S. PAT. OFF.

CONTINUOUS IMPROVEMENT

MICRO-WELDERS with dial indicating annealing attachments are now available for high carbon wire.

There is positive control of annealing temperature and already hundreds of these special MICRO-WELDERS are proving their dependability and satisfactory performance with leading manufacturers.

Model E.-I-S Welder Capacity .010 to .062" high & low carbon wire.

MICRO PRODUCTS COMPANY
20 NORTH WACKER DRIVE, CHICAGO 6, ILL.
Telephone, State 7468

ROSS "Universal"

Welding Rod OVENS

PAT. PENDING

Handle all types and sizes.
Controlled zones of heat and circulation.
Rods carried from pass to pass without jamming or marking.

Built in multipass and single pass continuous types, these modern ROSS "Universal" Ovens can be installed to process from 200 to 1200 rods per minute. Maximum flexibility of operation for handling any type of coated rod. Uniform control of air temperature, circulation and humidity throughout heating zones assures speedy production of hard, firm, dry coated rods, regardless of type.

ROSS "Universal" Ovens are used by such leaders as:—Arcrods Corporation in five plants; Metal & Thermit Co.; The McKay Co.; Harnishchfeger Co.; A. O. Smith Co.; Westinghouse Electric & Mfg. Co.; General Electric of Canada—and many others.

ROSS SYSTEMS

J.O.ROSS ENGINEERING CORP.

350 MADISON AVE., New York 17, N. Y.

CHICAGO 6—201 N. Wells St. DETROIT 3—12953 Greeley Ave.

ROSS ENGINEERING OF CANADA LTD.—Dominion Sq., Bldg., Montreal

Government Wire Production Information

(Continued from Page 493)

Board advises. Chief among specific suggestions made by the committee were (1) that all goods offered for sale should be completely described in terms commonly used by the industry; (2) that samples should be furnished; and (3) that the bid invitations should, if possible, identify the product by stating the manufacturer's name and whether or not his name appears on the shipping containers.

✦ ✦ ✦

FOLLOWING reports by committee members that triple alloy steel is unsatisfactory for recessed head aircraft screws, WPB officials said that single alloy steel will be provided for this purpose if no other alloy can be used. Appeals are to be made by the individual companies, not for the industry as a whole.

✦ ✦ ✦

Notes on Screw Machine Products Committee — June Meeting

SERIOUS shortages in key personnel and a loss of approximately 20 per cent in the total number of wage earners employed were reported at the recent meeting of the Screw Machine Products Industry Advisory Committee, the War Production Board said today. The industry has an average six months' backlog of unfilled orders due chiefly to loss of hand screw operators, tool makers, inspectors, tube and shaft machine operators, automatic machine operators and set-up men.

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THE current farm machinery and truck-trailer programs are increasing requirements for screw machine products, the committee was told, and in general all production programs affecting the industry have been increased.

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COPPER base alloys are in short supply, WPB officials informed the committee, with special copper base alloy rods particularly tight, and wire relatively

so. Wire made of less popular alloys is available, however.

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THE supply situation for fibre boxes was reviewed at the meeting. The industry was urged to conserve boxes through salvage and reuse. In general, industry members said, boxes are returned in poor shape and only about 20 per cent can be re-used.

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Restrictions on Tin Modified

MINOR amendments of its restrictions on tin uses were announced recently by the War Production Board.

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AMENDMENT of General Preference Order M-43 effects the following changes:

(a) **Raises from 21 per cent to 30 per cent the tin content of solder which may not be used except as specifically permitted by the order.**

(b) **Requires the prescribed certification in the purchase of all solders. Formerly, the certification was required only in purchasing solder containing more than 30 per cent tin.**

(c) **Adds radio, radar and electrical appliances to the list of products in which solder containing not more than 35 per cent tin may be used.**

(d) **Adds fabrication of terne plate tanks to the list of operations in which 35 per cent tin solder may be used.**

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Molybdenum and Tungsten Committee Meets

THE Molybdenum and Tungsten Wire and Rod Industry Advisory Committee at a meeting in Washington recently discussed problems of wire straightness, tolerances on radio component parts, tensile strength and inspection methods of wires and rods.

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AT the joint meeting, radio engineers and wire rod producers explained their difficulties in conforming with the various specifications of the radio industry, WPB reported. Radio engineers said the tolerances set up by the Army and Navy for tungsten components

(Please turn to Page 496)

...ALWAYS Good Form
IN THE FORMING ROLLS!
ROEBLING STRIP STEEL quality shows good form at the point where it counts the most . . . final fabrication!
Here specifications for steel analysis, dimensions and finish face the acid test—and that's where Roebling Strip Steel pays off in faster production . . . fewer rejects . . . less machine maintenance.
Whether you need round, flat or shaped wire . . . for coiling springs, punching, drawing or forming . . . you can share the "know how" gained in 100 year's of wire specialization by specifying "Roebling". Send us complete information and specifications for prompt action on how we can serve you . . . help you save money.
JOHN A. ROEBLING'S SONS COMPANY
TRENTON 2, NEW JERSEY
Branches and Warehouses in Principal Cities
FLAT WIRES
ROUND
SHAPED
STRIP STEEL
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PACEMAKER IN WIRE PRODUCTS
WIRE ROPE AND STRAND • FITTINGS • AERIAL WIRE ROPE SYSTEMS • COLD ROLLED STRIP • HIGH AND LOW CARBON ACID AND BASIC OPEN HEARTH STEELS • ROUND AND SHAPED WIRE • ELECTRICAL WIRES AND CABLES • WIRE CLOTH AND NETTING AIRCORD, SWAGED TERMINALS AND ASSEMBLIES • SUSPENSION BRIDGES AND CABLES

"Commando" of the VICTORY GARDENS

*GARDEX Tools Made with KEYSTONE Wire

Many a victory gardener "establishes a beachhead" in the corner of his garden and progressively "advances the attack" against weeds with his Gardex Tools.*

Gardex Tools are built to *win* the war on weeds. The blades and prongs are made of heat-treated high carbon wire, assuring strength and stamina right down to the "fighting edge".

*Gardex, Inc., Michigan City, Indiana

Along with the Gardex Company, hundreds of other manufacturers use Keystone wire in their products, many of which are vital parts of planes, ships, tanks, guns, ammunition, and such vital war materiel.

KEYSTONE STEEL & WIRE CO.
PEORIA 7, ILLINOIS

Special Analysis Wire for All Industrial Uses

SAMSON SPRING WIRE

Coppered, Tinned, Annealed, Galvanized

Government Wire Production Information

(Continued from Page 495)

are too narrow for efficient production.

✦ ✦ ✦

IN discussing straightness problems, it was brought out at the meeting that several degrees of wire straightness are required, and an effort should be made to so inform tungsten producers receiving the various orders whenever special straightness is necessary.

✦ ✦ ✦

NO particular uniformity exists in the inspection methods of ground seal rod, committee members said. Repeated inspections usually reveal additional material to be rejected, one radio engineer pointed out. The general practice of the tube industry, he said, is to accept material from wire and rod manufacturers, which they, in turn, inspect and cull. The procedure of returning complete shipments on the basis of spot inspections was reported not to be a general practice.

✦ ✦ ✦

A discussion on the methods of testing stretch in molybdenum wire indicated a more or less uniform procedure, the committee told WPB. No answer was given to the request of the tungsten producers to set a minimum stretch figure. Present stretch requirements are set too high, producers indicated.

✦ ✦ ✦

Rivet Industry Starts Standardization Program

PLANS for the creation of a voluntary standardization and simplification program for the industry were discussed by members of the newly-organized Rivet Industry Advisory Committee at their first meeting recently in Washington.

✦ ✦ ✦

THE industry expects a saving in manpower and material and a reduction in stock and tools will result from the standardization of some sizes and designs of rivets.

The group reported that shortage of manpower was the industry's greatest production problem at present. Government officials informed them that the new WMC recruitment plan might afford some relief. The industry does not have a large surplus stock accumulation, committee members said. Up to the present time. the industry has been able to absorb into its own stock most of the surplus from contract terminations.

✦ ✦ ✦

New Standards Adopted for Industrial Control Apparatus

THE American Standards Association has announced approval of a revised American Standard for industrial control apparatus in the heating, generating, and general machinery fields. This correlates information contained in two important standards of the electrical industry — the old AIEE Standard No. 15 and the NEMA Industrial Control Standard published in 1937.

THE new American Standard is a working document of practical information concerning the manufacture, test, and performance of industrial control equipment. Representing, as it does, standardized practice in the United States, it assists in harmonizing practices in the industry, promotes production economies, and consequently benefits users of electric motors and control equipment. It covers industrial motor control, similar control used for industrial heating, and rheostats, including those for the generator field.

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THE American Standards for Industrial Control Apparatus (C19.1-1943) may be obtained for 50 cents per copy from the American Standards Association, 29 West 39th Street, New York 18, N. Y.

✦ ✦ ✦

New Use for Wire in War

AN ingenious method of preventing deadly "shrapnelling" of the oxygen and carbon dioxide cylinders used for breathing and fire-fighting purposes aboard U. S. planes has been developed by engineers of Walter Kidde & Company, largest U. S. makers of these steel gas bottles. Untreated cylinders can explode into pieces of shrapnel like flying steel when hit by flak or enemy machine gun bullets during combat, due to the terrific internal pressure, and the fragments can riddle the fuselage of a plane. The new Kidde process consists of wrapping each cylinder tightly with high-tensile steel wire so that a bullet leaves a clean hole with no fragmentation.

✦ ✦ ✦

Copperweld Steel Co. Plans New Unit

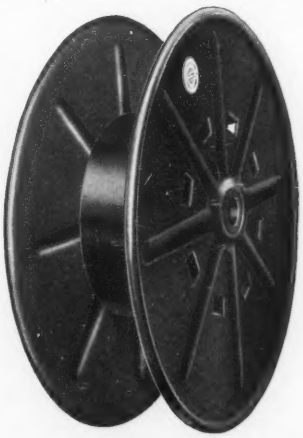
PLANS have been completed for construction of a new unit at the plant of the Copperweld Steel Company, 9th and Allegheny Streets, Glassport, Pa. Plans are in charge of J. P. Smith, chief engineer, and provide for a structure, 100 by 126 feet in size.

MOSSBERG PRESSED STEEL CORP.

Greater service from a new All Welded Steel Take Off Reel designed to meet present day requirements.

Usual maintenance expense eliminated by adoption of this new design wherein all parts are welded into one homogeneous unit.

Reel sides are embossed with radial reinforcing ribs for increased rigidity with rolled edges for additional strength and to facilitate handling.



All Welded Steel Take Off Reel

Complete line of spools and reels for both processing and shipping all kinds of bare and insulated wires and cables. (Send for Catalogue W-104)

MOSSBERG
PRESSED STEEL CORP.
18 West Street
Attleboro, Massachusetts, U. S. A.

Ross Whitehead & Co., Ltd.,
Montreal & Toronto, Canada.

James Day (Machinery), Ltd., "Ford House," 88 Regent Street, London, W. I., England.

Outstanding Personalities of the Wire Industry

Fuller Made Vice President of Bethlehem Steel

H. H. Fuller has been elected vice president in charge of West Coast steel activities of Bethlehem Steel Company effective July 1st, it was announced by E. G. Grace, president of the company.

✦ ✦ ✦

MR. FULLER succeeds W. H. Stewart who has held the office for the past 12 years. Though retiring from active duty, he will continue in an advisory and consulting capacity.

✦ ✦ ✦

MR. FULLER entered the employ of Bethlehem at the close of the first World War. In 1936 he became assistant manager of sales for the New York district and two years later was appointed district sales manager.

Westinghouse Electric International Company Elects New Officers

John W. White has been elected President and General Manager of the Westinghouse Electric International Company, subsidiary of the Westinghouse Electric and Manufacturing Company, it was announced recently. William E. Knox, formerly assistant general manager, has been elected Vice President.

✦ ✦ ✦

FORMERLY Vice President and General Manager, Mr. White succeeds George H. Bucher, who becomes Chairman of the Board of the International Company. Mr. Bucher is President of the Westinghouse Electric and Manufacturing Company.

✦ ✦ ✦

MR. White joined the Westinghouse Electric and Manufacturing Company at its Pittsburgh, Pa., headquarters 39 years ago, and from 1907 to 1918, except for four years spent with another manufacturing company, was in the Sales Department of the Company in Pittsburgh, Detroit and Chicago.

✦ ✦ ✦

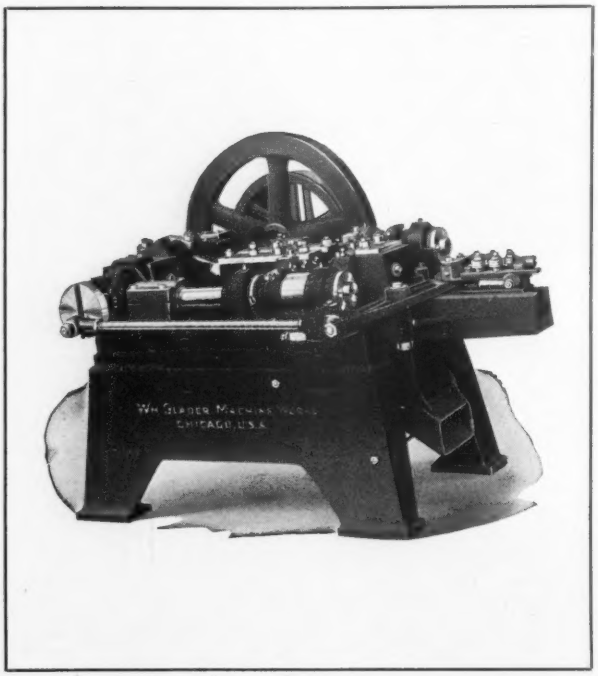
IN 1932, Mr. Knox was appointed assistant to the general manager, and in 1937 was named assistant general manager. In 1940 he was awarded the Westinghouse Order of Merit, highest honor bestowed by his Company, and in 1942 won the Chilean Order of Merit, with the rank of Commander.

✦ ✦ ✦

Prins Heads Riehle's New York District Sales

APPOINTMENT of **A. Winkler Prins** as manager of the New York district sales territory of

GLADER HIGH SPEED WIRE NAIL MACHINE



High tonnage output, and low maintenance costs, have resulted in Glader Machines being accepted as standard equipment in every large nail mill built in the United States in the past twenty years.

Glader Machines are operating in most of the wire producing mills throughout the world.

These machines are made in eleven different types and sizes. This enables us to cover the range of sizes of nails produced with the greatest efficiency.

For further information please address,

WM. GLADER MACHINE WORKS

210 NO. RACINE AVE.
CHICAGO, ILLINOIS

American Machine and Metals, Inc., has just been announced.

✦ ✦ ✦

MR. Prins was born on the Island of Java, Dutch East Indies, and educated in Holland. He is a graduate of Carnegie Institute of Technology and assumes his duties as district manager of American Machine and Metals, Inc., in their new offices recently moved to the Woolworth Building in New York City. He will supervise the sales and service activities of his company for their Troy Laundry Machinery, DeBothezat Fan, Riehle Testing Machine and Tolhurst Centrifugal divisions.

✦ ✦ ✦

H. H. Smith Assistant Manager Metallurgical Dept., American Steel & Wire Company

ANNOUNCEMENT of the appointment of **H. H. Smith** as assistant manager, metallurgical department, has been made by the American Steel & Wire Co., Cleveland. Mr. Smith replaces the late Lawrence H. Dunham.

MR. Smith first became associated with the Wire Company in 1928, when he was employed as a laboratorian at Donora, Pa. Four years later he was promoted to metallurgist and in 1936 was transferred to the Pittsburgh district office. In 1940 he returned to Donora as works metallurgist, a position which will now be filled by R. A. Woodside.

✦ ✦ ✦

Joins INCO's Technical Service Group

H. **O. Teeple,** chemical engineer, has joined the Technical Service Group of the Development and Research Division of The International Nickel Co., Inc., at New York, T. H. Wickenden, Manager of the Division, announces. He will specialize in corrosion problems. He has had experience in production, process control, and maintenance engineering, including equipment specifications, corrosion control and the use of metals, alloys, plastics, and special paints.

✦ ✦ ✦

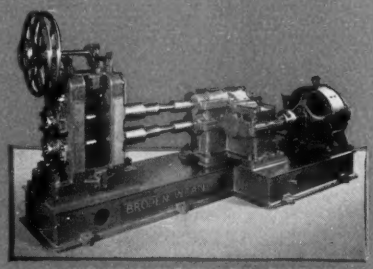
Fort Wayne Wire Die Company Adds to Staff

Amos D. Pumphrey has been appointed as Sales and Service Engineer, in charge of sales of diamond and carbide dies, according to an announcement received from Paul Bieberich, owner of the Fort Wayne Wire Die Company.

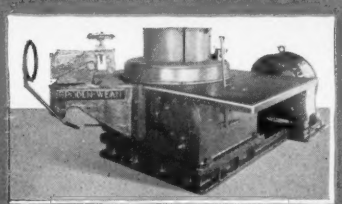
✦ ✦ ✦

MR. Pumphrey has been associated with the wire and die industries for twenty-four years. Starting in the wire mill of the Dudlo Manufacturing Company in 1920, he went into the die shop in 1925. Since 1930 he has been foreman of the die shop and wire mill of the Inca Manufacturing Division of the Phelps Dodge Copper Products Corp., bringing to his new connection many years of practical experience.

WEAN-BRODEN



Small Cold Rolling Strip Mill



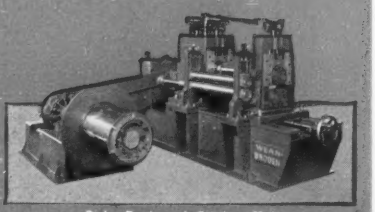
Special Alloy Single Draft Heavy Duty Vertical Wire Drawing Block for ¼" Round Wire

THE Wean Engineering Company, Inc., have long been recognized as specialists in sheet, strip and tin mill equipment . . . The Broden Construction Company specializes in the manufacture of narrow strip and wire mill equipment.

With the extended facilities of The Broden Construction Company as a subsidiary of The Wean Engineering Company, Inc., it is now possible to serve the steel industry more effectively.

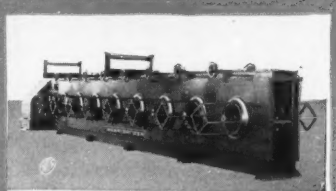
COLD ROLLING MACHINERY
For 36" Wide Material and Narrower
Mills • Reels • Slitters • Levelers • Coilers
Edgers • Scale Breakers • Shears
Scrap Ballers • Continuous Pickling

WIRE MILL EQUIPMENT
Wire Drawing Machines • Patenting
Galvanizing and Tinning Take-Up Frames
Wire Flattening • Spoolers • Nail
Galvanizing and Blueing



Strip Reel and Slitting Unit

HOLMQUIST BARBED WIRE and WIRE FENCE MACHINERY



The BRODEN CONSTRUCTION Co., Inc., Cleveland, O.
A SUBSIDIARY COMPANY OF
The WEAN ENGINEERING Co., Inc., Warren, O.

Wickwire Spencer Buys Sirian Wire and Contact Company

THE Wickwire Spencer Steel Company announced today the purchase of the business and assets of the Sirian Wire and Contact Company of Newark, New Jersey. The steel company will immediately assume full control of all management and production operations of Sirian.

✦ ✦ ✦

THE Sirian Wire and Contact Company manufactures a substantial percentage of all the fine drawn tungsten and molybdenum wire and rods, used in the radio, electronic, electrical instrument and lamp industries. In addition, various dies and tools of tungsten carbide are manufactured. All products of the company are vitally essential to the war effort and currently the complete output is for war work.

THE purchase of Sirian is in line with Wickwire Spencer's policy of expansion to include operations for greater post-war markets and developments. In connection with the new property, Wickwire Spencer announced the formation of a new subsidiary company, the Wickwire Spencer Metallurgical Corporation. The subsidiary's former name, Sirian Wire and Contact Company, will be dropped.

✦ ✦ ✦

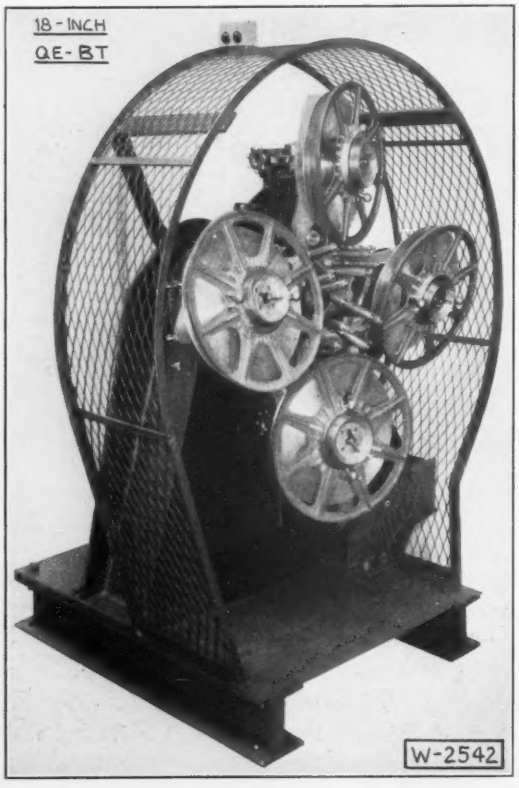
OFFICERS of the new corporation are as follows: President, E. P. Holder; Executive Vice President, Lt. Col. Cecil P. Young, Retired; Treasurer, George H. Creveling; Secretary, Franklin Berwin. Operations will be under the direction of Col. Young, well known in the aeronautical field. Recalled to active duty with the U.S.A.A.F. immediately after Pearl Harbor, Col. Young was appointed Executive Officer of the New York Air Defense Wing and was in charge of the development of Air Defense and the training of combat pilots in this area. In December 1943, he returned to inactive status and since then has been Executive Vice President of the Wickwire Spencer Aviation Corporation, a subsidiary of Wickwire Spencer Steel Company.

✦ ✦ ✦

MR. L. D. Granger, prominent steel metallurgist and engineer, will also be connected with the Wickwire Spencer Metallurgical Corporation. Mr. Granger is a Vice President of and has long been associated with the American Wire Fabrics Corporation, another subsidiary.

✦ ✦ ✦

OFFICES will be continued at the company's plant, 260 Sherman Avenue, Newark 5, New Jersey.



THE WATSON MACHINE COMPANY
ESTABLISHED 1845
PATERSON, NEW JERSEY, U. S. A.

ELECTRICAL WIRE and CABLE and WIRE ROPE MACHINERY

Eccentric Taping Heads Type "BT" for all non-metallic tapes. Patented constant tension. Available in many sizes and combinations. All anti-friction bearing, magnesium and aluminum alloy construction. Rapid self-locking adjustments. Automatic stops and signal lights. Fixed selective multi-speed tumbler or infinitely variable speed head drives. —

Metal tapers and high speed, dynamically balanced concentric tapers are also offered and employ the same patented principles.

LITERATURE ON REQUEST

Polyethylene—A Carbide Production Achievement for the Navy

Important New Plastic Has Many Unusual Properties

THE Navy Department has now given Carbide and Carbon Chemicals Corporation permission to reveal its remarkable production record for polyethylene plastics, component of coaxial cable used in radar equipment. In a little more than two years from the date the corporation was given the assignment, Carbide is producing the Navy's requirements for polyethylene at a rate 600 per cent of the designed capacity of the plant.

✦ ✦ ✦

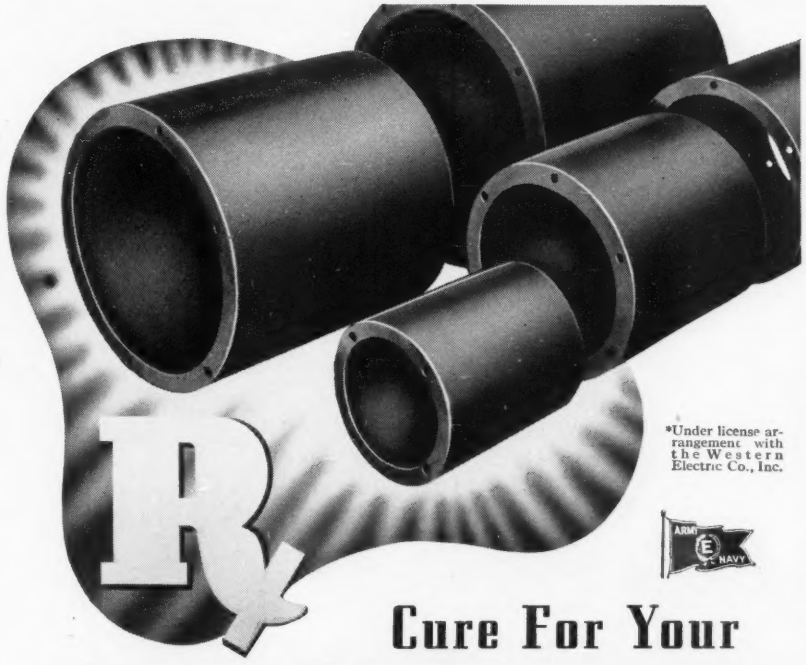
THESE polyethylene plastics are inherently flexible, translucent materials that possess many unusual properties. They are entirely new materials, unique in the plastics field as well as in the industrial field. These plastics have excellent insulating properties, are tough and resistant to shock, and will absorb inappreciable amounts of water; films of the material will not even permit the passage of appreciable amounts of water vapor. In addition, polyethylene softens at the unusually high temperature for thermoplastic materials of 230 deg. F., above the temperature of boiling water, and remains virtually unaffected by temperatures 90 degrees below zero, Fahrenheit.

✦ ✦ ✦

POLYETHYLENE plastics are produced under strictly controlled conditions. By changing the conditions of manufacture, the properties of the base resin can be varied to satisfy the needs of particular applications. At the present time only one grade of resin is being produced. Among the properties which can be varied are tensile strength, elongation at break, tear resistance, and brittleness temperature. The properties of the resin indicate that the use of these materials in future years will be extremely widespread. Because they are colorless as manufactured, the resins can be produced as clear translucent articles or can be formulated in a wide color range offering exceptionally high luster. The plastics are so light that they will float on water. They can be processed by the methods now employed for the older types of thermoplastic materials. They may be extruded, molded, fabricated into sheets and film, and coated on to cloth.

✦ ✦ ✦

ALL types of polyethylene plastics are distinguished by a dielectric constant at 50 mc. of 2.29 and a power factor of 0.0003; low water absorption (0.03 per cent weight gain in 100 hours), and low transmission of water vapor; and resistance to attack by many chemicals, including a number of solvents. As these materials are inherently flexible, the use of a plasticizer is unnecessary. The excellent electrical properties of the resin are of primary importance in present-day uses and suggest many new applications when greater quantities are available. Data giving details of characteristics and properties may be obtained upon request from the Corporation at 30 East 42nd Street, New York, 17, N. Y.



*Under license arrangement with the Western Electric Co., Inc.

ARMY E NAVY

Cure For Your DRUM or TRAVERSE Worries

You can benefit by the experience Hubbard brings to the manufacture of drums or traverses* for all types of reels. Our Garrett Division plant produces traverses in all standard sizes, in plain, painted or hot dipped galvanized finishes.

You'll be interested in complete details concerning our prices and deliveries. Just drop us a line today for this information.

HUBBARD SPOOL COMPANY

1624 CARROLL AVENUE | CHICAGO, ILLINOIS

Since 1912, manufacturers of wire drawing and annealing, and shipping spools and reels.

New Use for Lucite

RESISTANCE of "Lucite" methyl methacrylate resin to attack by acids is the basis for a new use of the plastic as the lining for 28,000-gallon tanks holding chromic and sulfuric acid anodizing solutions in the treatment of aluminum alloy aircraft parts.

PLANT officials have found "Lucite" less expensive, lighter, less subject to breakage, and easier and safer to handle than the material which the plastic replaced. The linings were installed as the result of the company's experience with "Lucite" tubes as the insulation for parts while exposed to the electrolytic action of the acid baths in which use the plastic was credited with doubling the output of the anodizing equipment at the plant.

✦ ✦ ✦

Norton Sets Up Office in Denver

NORTON Company, Worcester, Mass., announces the formation of a new sales territory to be known as the West Central, Rocky Mountain District. It will be under the supervision of Ralph O. Anderson, with headquarters in Denver, Colorado. Mr. Anderson has been with Norton Company over thirty years and for a long time was district manager in Pittsburgh. For several years he has been handling special assignments.

✦ ✦ ✦

F. L. Anderson, G. W. Thomson, and **G. L. Freeman** with headquarters in Kansas City, Missouri, Dallas, Texas, and Houston, Texas respectively will report to Mr. Anderson who is responsible to W. E. Shumway, Sales Manager, Western Region.

✦ ✦ ✦

Harper Company Given Fourth Award

THE fourth award for excellence in war production was granted June 20, 1944 to the employees of The H. M. Harper Company, nonferrous bolt and nut manufacturer, 2620 Fletcher Street, Chicago 18, Illinois. This was one of the earliest fourth awards to Chicago manufacturers, and the first such award to a member of the bolt and nut industry.

✦ ✦ ✦

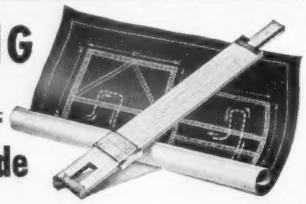
THIS ceremony emphasized the important role played in war by small parts and accessories. Non-ferrous and stainless fastenings are indispensable in jeeps, tanks, ships and a host of other war equipment.

✦ ✦ ✦

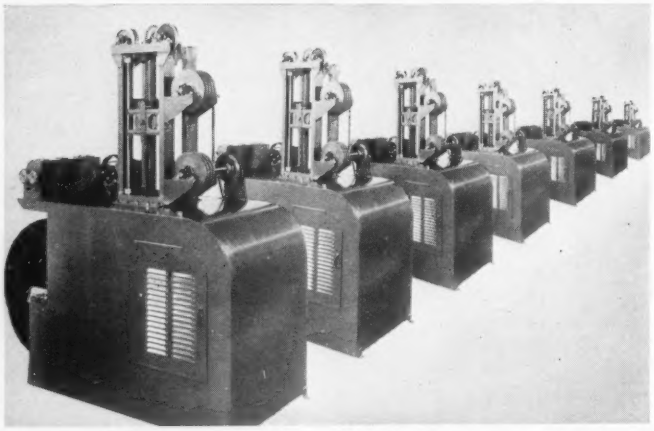
Edward W. Ihrig

Edward W. Ihrig, 73, president and treasurer of the Pine Ihrig Machine Co., Oshkosh, Wis., died June 12 of injuries received in an automobile accident.

OVEN ENGINEERING NEWS



IOE Windup Machine Now Made In Quantity Lots for Many Problems of Wire Manufacture



• Originally developed as special equipment to speed the production of more uniform cable insulation finishes, the **IOE** constant-speed constant-tension windup machine has since provided a solution for a number of other manufacturing problems. It is now used for saturating take-up, respooling, continuous spark testing take-up, single-reel extrusion take-up, and tubing, waxing and enameling take-up.

These machines are still made to individual order, but all parts are standardized, and the units are being built in quantity. Two standard sizes are now available. These are:

No. 1—26" - 36" reel diameter
No. 2—12" - 24" reel diameter

The **IOE** windup machine is a complete, self-contained unit with combination variable speed and hydraulic synchronizing equipment, designed to provide constant speed and constant tension within a variable production range. By arrangement of adjustable tension devices, tension on the material can be varied from a few ounces to hundreds of pounds. The machine is motor driven, requires no outside source of power or synchronization, and can be used in conjunction with either driven or friction unwind machinery. It is supplied in higher speeds for extrusion windup of rubber and synthetic insulation materials.

GET MORE DATA

• "Blueprint for Industry — Part III" describes the **IOE** windup machine in detail. Send for your copy.

(This is No. 13 of a series. Reprints of previous advertisements will be sent free upon request.)

THE INDUSTRIAL *Oven Engineering* COMPANY

11621 Detroit Avenue **Cleveland 2, Ohio**

The Manufacture of Specialty Diameter Wire

STEP-WIRE is used to "open or enlarge, and ultimately to polish the inside diameters of jewel bearings. Originally jewels were "opened" with short individual single diameter pieces of wire. These short pieces were drawn through a diamond die to produce a specified diameter. Then jewels, numbering anywhere from 70 to 190, depending on their size, were strung on the wire. The section of wire holding the jewels was then placed in a stationary "bobbin" containing an abrasive of diamond powder in an oil medium. An operator grasped the protruding ends of the wire and worked it back and forth until the jewel had been "opened" to that diameter. The same procedure of stringing, etc. had to be repeated with each increase of diameter as many as twelve or more times. This obviously resulted in a very great loss of time but it was the best method then known. In due time step-wire was introduced, eliminating the arduous task of restringing tiny jewels over and over again.

✦ ✦ ✦

STEP-WIRE, as the name implies, is essentially a continuous wire, the diameter of which increases several hundred thousandths' of an inch at specified intervals. These diameters may vary from .0024 inches to .0352 inches depending upon the size of the jewels to be "opened". This type of wire has been used by various jewel manufacturers for some time.

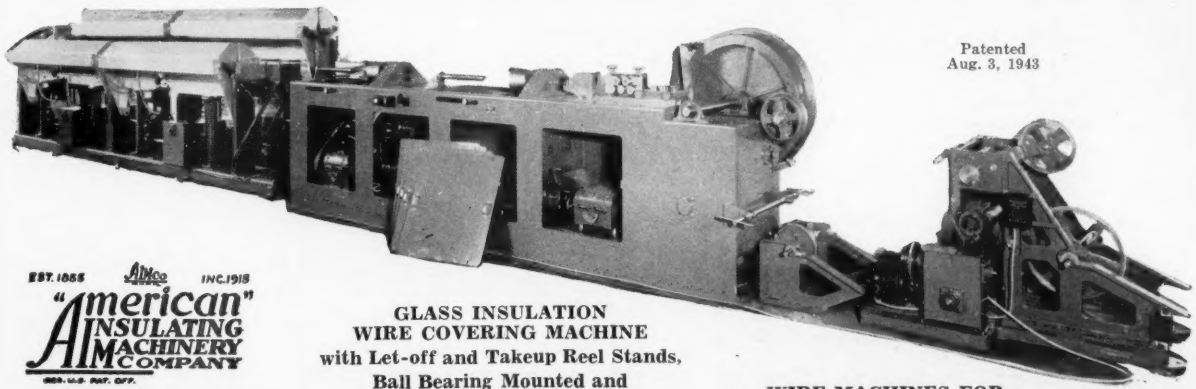
✦ ✦ ✦

STEP-WIRE, however, was very costly to produce; not only from the standpoint of the expensive equipment required including some 300 odd diamond dies, but also from the standpoint of time and skilled labor involved. Also when very small diameters were needed on the production line, breakage was very high. The old method of making step-wire was similar to that of regular wire drawing. The die was held stationary in the holder on the wire drawing machine. A specified number of feet of wire were drawn through a die of given diameter, beginning with the die of **largest** diameter in the series of "steps". This largest diameter die was then stripped off **backwards** and a die of slightly smaller diameter was then placed in the holder and the wire drawn through as before. Thus this procedure continued until the desired number of steps had been drawn. This slow and tedious operation was further complicated by the fact that in stripping the dies off the wire, the relief angle of the die was sharp enough in many cases to cut the wire and great care had to be taken to prevent damage to the wire.

✦ ✦ ✦

WHEN the **Hamilton Watch Company** began manufactur-

(Please turn to Page 506)



Patented Aug. 3, 1943

EST. 1885 AIMCO INC. 1918

"American" INSULATING MACHINERY COMPANY

517 West Huntingdon St.
Zone 33
PHILADELPHIA PENNSYLVANIA U.S.A.

GLASS INSULATION WIRE COVERING MACHINE with Let-off and Takeup Reel Stands, Ball Bearing Mounted and Variable Speed Motor Drive, Baking Ovens with Two Coat Varnish Applicators, and Individual Automatic Temperature Controllers.

WIRE MACHINES FOR
Drawing, Enameling, Tinning, Spooling, Insulating with Glass, Asbestos, Paper Tape, Cotton, etc. Multiple Pullouts, Rubber covered wire Panners, etc.

The Manufacture of Specialty Diameter Wire

(Continued from Page 505)

ing jewels in quantity, the problem of producing large amounts of step-wire arose. It was turned over to **Ed Shubrooks,** Hamilton's chief chemist and metallurgist, and his staff. After a bit of research a simple, inexpensive and very efficient method was devised.

✦ ✦ ✦

THIS method is essentially the **reverse** of normal wire drawing procedure. The size and number of diamond dies to be used is determined. These are then placed side by side in a rack at one end of the work bench, parallel to its length, and with the die of largest diameter in position to be used **first.** A piece of wire cut to the overall length required, is stretched the length of the bench, the end pointed and the dies forced on in their proper order. This end of the wire is securely fastened to the bench with a clamp. Strips of wood, the desired length of the "steps" to be drawn — usually 6" to 24" — are fastened along the length of the bench with a space the width of a die between them. These materially aid the operator in determining where to stop the "trolley" or "holder", which holds the die as he forces it along the wire, as well as serving as the bed of the machine itself. Additional markings, usually made with a pencil, are made along the edge of the bench to aid the operator in allowing for the slack in the wire created as he draws each step. These markings vary with the kind and size of the wire being drawn.

✦ ✦ ✦

THE operator, starting with the die of largest diameter, first pushes or forces it along the length of the wire up to his first "stop" on the far end of the bench. He then returns and forces the second die the length of the wire up to the second "stop", and continues the procedure until all "steps" have been drawn. The wire is then wound onto a spool affixed to the far end of the bench, and is then ready for use on the production line. As each die reaches the spool during the winding process it is stripped off backwards into the rack ready for the next operation — thus another time and money saving short-cut has been added to the record of Hamilton's ingenious engineers.

✦ ✦ ✦

Steel for Garment Hangers Increased 15% by WPB

MANUFACTURERS of garment hangers are permitted to use, in the second quarter of this year, 15 per cent more iron and steel than previously in making garment hangers for civilians, the War Production Board states.

✦ ✦ ✦

AS established in Direction 2 to Limitation Order L-30-d (issued June 13, 1944) in the second quarter of this year, each manufacturer of garment hangers may use 35 per cent of the average quarterly amount of iron and steel used by him in making garment hangers in the year ending June 30, 1941. This is in addition to iron and steel used to make garment hangers for military purposes as well as any unused part of the first-quarter quota.

✦ ✦ ✦

PREVIOUSLY only 20 per cent of the amount of iron and steel used in the base period was permitted to be used for garment hangers for civilians.

✦ ✦ ✦

STEEL wire of any gauge, obtained from any source, may now be used to make garment hangers, WPB said. Previously only wire shorts or rejects and wire obtained from distressed stocks or included in a manufacturer's inventory on July 17, 1943, and then only certain gauges, were permitted to be used for hangers.

Gilron

DRAW YOUR WIRE THE MODERN WAY with

GILRON COATING COMPOUNDS

A big step forward in wire drawing. Thoroughly proven in mill practice. Makes possible wire drawing speeds heretofore considered impracticable. Increases die life, prevents scratching of wire, produces better finish and eliminates use of lime in many cases.

These coating compounds are of particular value in the more difficult operations — stainless, alloy, high carbon and welding rod wire. Multiple reductions can be drawn without re-coating.

Coatings for Drawing Stainless, Alloy, Low and High Carbon and Copper Coated Wires

Let us confer with you. Write or telephone for particulars.

GILRON PRODUCTS COMPANY

1559 EAST 40th STREET • CLEVELAND, OHIO

Telephone HEnderson 8375

G.E. Announces New Formex Wire

FORMEX ribbon-rectangular magnet wire available in shapes as thin as 0.004 inch, has been announced by the General Electric Company. The new Formex, being made for the war program, in one-fourth the size heretofore considered the low limit for thickness of this wire.

✦ ✦ ✦

SMOOTH, strong, flexible, and able to withstand high-speed winding without damage to insulation, this wire offers many application possibilities to producers of electronic devices and other electric components.

✦ ✦ ✦

IN coil winding, varnish treatment, assembly and actual operation, this new magnet wire presents advantages. It has high dielectric strength resistance to abrasion, heat-shock, and solvents.

✦ ✦ ✦

BECAUSE of its thinness, the wire can be applied where round wire previously had to be used. In addition, this new magnet wire will substantially increase the winding space factor and may be used in place of larger-size, rectangular magnet wire to increase magnetic effect or reduce coil size.

✦ ✦ ✦

William M. Wheeler

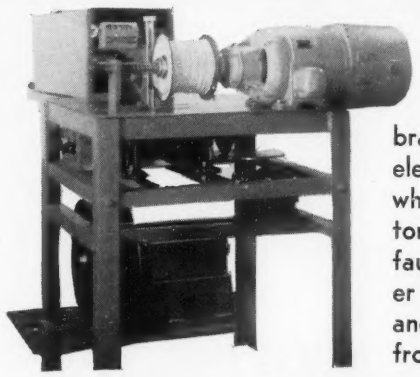
William M. Wheeler, Executive Secretary, American Chain & Cable Company, Inc., Bridgeport, died recently in a Bridgeport hospital following a week's illness.

✦ ✦ ✦

BORN in Stratford, Connecticut, he was graduated from Yale in the Class of 1895. He had been associated with Walter B. Lashar since September 1905 when the latter formed the Weed Chain Tire Grip Company, predecessor to the American Chain Company which was formed in 1912. He also continued as Secretary of the American Chain & Cable Company, Inc., established in 1936.

SPARKER for SPOOLING SMALL WIRES

THIS APPARATUS WILL AUTOMATICALLY STOP WHEN DIELECTRIC FAULT OCCURS, or when the machine has wound a predetermined length of wire.



It is equipped with a gear head motor, electrical brakes on take-up and pay-off, electrode, control apparatus which automatically reduces the torque of the motor in starting, fault light indicator, transformer with tap switch, volt meter, and variac. Range of voltage from 1,000 to 16,000 volts.

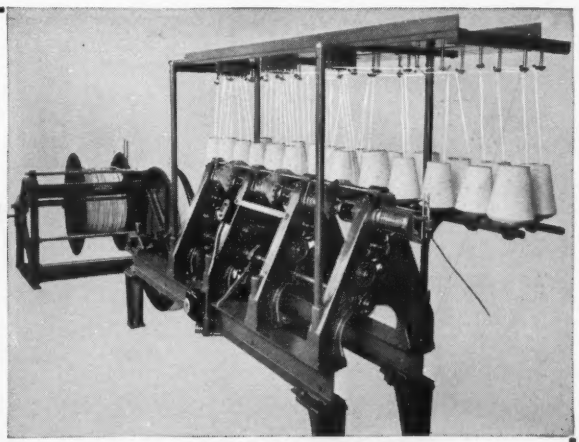
Please Address Inquiries To:

R. L. DAVIS ELECTRIC CO., INC.

WALLINGFORD, CONN.

FIDELITY SINFRA MULTIPLE-HEAD HIGH-SPEED COVERING MACHINES

• • •



Knits two or three cotton coverings on bare wire up to #6 gauge—also flat or shaped, continuous-strip material, 1200 to 1500 feet per hour. Saves rubber since cotton coverings, impregnated, form excellent insulation. Straightening rollers operate horizontally and vertically. Each head knits one cover. 20″ or 36″ capstan take-off—separate haul-off reel stand, 40″ O.D., with traverse mechanism, 1000 lb. capacity.

Other advantages include: automatic electric stop motion on each yarn; improved knitting head and needle design; knits direct from large cones; quiet operation reduces operator fatigue.

Available in double- and triple-head types. Write for Bulletin.

Designers and Builders of Intricate, Automatic Precision Machines

32 YEARS' EXPERIENCE

FIDELITY MACHINE COMPANY

3908-18 FRANKFORD AVENUE, PHILADELPHIA 24, PA.

APEX "PIC-KLEEN" PERFORMANCE DATA

Type of wire: Stainless Steel—Series 304
Speed: 450 F.P.M.
No. of Holes: Two
Drawn: Dry
Dies: Carbide
Reduction per die: 100 Points
From: 5/16" oversize hot-rolled rod.

Results: The heretofore necessary use of LEAD COATING or OXIDE COATING was entirely eliminated through the use of *APEX "PIC-KLEEN"* itself as the coating substance necessary for making these reductions.

Conclusion: We can duplicate in your mill the successful tests performed in many others. Please write

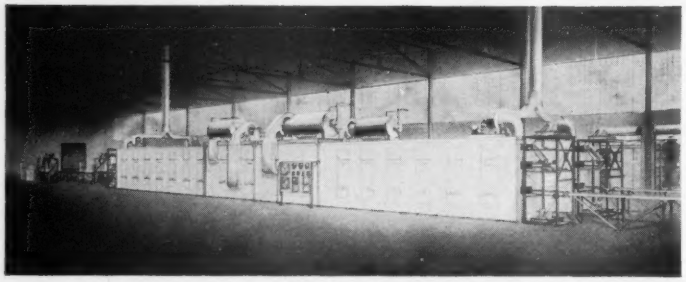
APEX ALKALI PRODUCTS COMPANY
MAIN AND RECTOR STREETS
PHILADELPHIA 27 PENNSYLVANIA

BOSTON, MASS. PITTSBURGH, PA. ATLANTA, GEORGIA
MERIDEN, CONN. DETROIT, MICHIGAN LOS ANGELES, CALIF.

MORE PRODUCTION IN LESS TIME *with* CARL-MAYER FURNACES, OVENS

CARL-MAYER HI-SPEED ROD BAKER

The fastest rod baker built! Saves up to 50% in time and fuel. Patented Blow-Off Feature removes moisture without bumping or agitating the coils. **Patented and patents pending.**



WELDING ROD OVEN
For drying coated welding rods. Uses the "Mayer" Recirculating Gas Fired Air Heater principle and Rod Transfer Systems (patents pending).

Growing interest in our type of equipment is evidenced by Carl-Mayer installations in such plants as:—

Atlantic Wire Co. Hollup Corp. Pittsburgh Tool Steel Wire Co.
Atlas Steel Co. Johnson & Nephew Ltd. Steel Co. of Canada
Eaton Mfg. Co. Page Steel & Wire Co. Wickwire Spencer Steel Co.

WRITE FOR BULLETIN #241

THE CARL-MAYER CORPORATION 3030 EUCLID AVENUE CLEVELAND, OHIO

Bulletin Published On Cereum

CEREUM is a comparatively little known element said to give important qualities to various metals. For instance, small additions to stainless steel, tool steels, electrical resistance and heat resistant alloys are known to refine the grain, stabilize carbides and nitrides, improve creep resistance and to decrease oxidation at elevated temperatures. Used in welding electrodes, the intensity of the arc and stabilization are said to be increased. Cereum is furnished as an alloy with aluminum, copper, gold, iron, lead, nickel, silver, tin and other metals.

✦ ✦ ✦

THE Cereum Metals Corp., 522 Fifth Avenue, New York, 18, N. Y. producers of cereum master alloys in ingots, powder and rod forms, has issued a bulletin entitled "Some Basic Facts About Cereum", which may be of interest to many wire mills. The Company also produces a group of sister elements known as "Rare Earth Metals". For the bulletin or detailed information, please address the Company direct.

✦ ✦ ✦

Fourth Production Honor Is Won By Habirshaw

THE Habirshaw Division of the Phelps Dodge Copper Products Corporation at Yonkers, N. Y. has been awarded a third renewal of the Army-Navy "E" award by the Navy Board of Production Awards. The original "E" pennant was awarded at ceremonies August 12, 1942. The first renewal was made March 12, 1943 and the second renewal was made December 6, 1943.

✦ ✦ ✦

Torrington Adds New Sizes of Propeller Fans

THE addition of several new sizes of propeller fan blades is announced by The Torrington Manufacturing Company, coincidentally with the release of a revised Airistocrat fan catalog. To the Standard series, a 27 degree pitch has been added in the 10"

and 12″ diameters. There is a new P-1027 in the pressure type fans or "P Series."

✦ ✦ ✦

THE new catalog contains complete NEMA and NAFM performance ratings for these new fans, as well as 159 others that go to make up the complete Torrington line of fan blades. Other new material in the catalog includes a series of "Tips for the Design of Air Impelling Units."

✦ ✦ ✦

COPIES of the catalog may be obtained upon request.

✦ ✦ ✦

Cap and Set Screw Industry Advisory Committee Meets

LARGE ordnance requirements for cap screws for replacement use overseas will tax the capacity of the industry, members of the Cap and Set Screw Industry Advisory Committee said at their first meeting, the War Production Board has reported.

✦ ✦ ✦

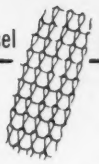
THE present backlog of orders averages six months, committee members said, and in some cases run to a year, since many customers place orders for months in advance. Requirements for these products for the farm machinery and truck-trailer programs are also large, WPB officials told the committee, and may increase.

✦ ✦ ✦

NO solution was arrived at as to how to bring requirements into line with production. Ordnance requirements will be studied carefully with a view to possible reductions, WPB officials said.

Our advertising pages — have you studied them carefully? They contain information to guide you in the successful operation of your business. And when you write an advertiser for prices, catalogs or detailed data, won't you please say you saw his ad in WIRE AND WIRE PRODUCTS.

Callite fine wires



for tinsel and scouring pads

for control cables

for springs

for wire screen

and for instrument parts

The quality of Callite Fine Wire has earned approval for a wide variety of applications . . . for sensitive instruments, springs, bonding jumpers, wire cloth and mesh, scouring pads, tinsel and scratch brushes. The expert craftsmanship in its drawing is proved time and again in performance.

Controlled throughout production, Callite Wire is drawn to optimum properties of the material specified, held to close tolerances, accurate to size and uniform in temper. We offer practical help on technical problems, cooperation in meeting production schedules. Callite Tungsten Corporation, 572 Thirty-ninth Street, Union City, New Jersey. Branch Offices: Chicago and Cleveland.

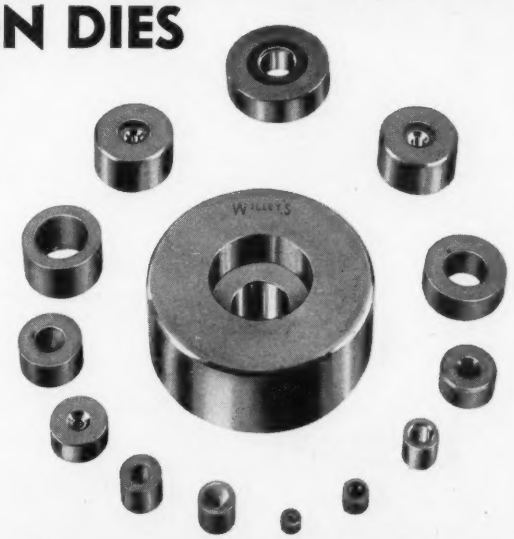
Callite
fine wires

Precision diameters down to .002", or smaller, Aluminum, Phosphor Bronze, Everdur, Commercial Bronze, Stainless Steel, Silver, Brasses, "Clad" Wires and special alloys. On spools, coils, or cut to your exact specifications.

WILLEY'S DIES LAST MUCH LONGER

WIRE DRAWING, SIZING and EXTRUSION DIES

Manufactured in all sizes, to meet your requirements, from a specially developed grade of Tungsten Carbide having freedom from porosity, exceptional abrasion resistance and the ability to take a polish equal to that of diamonds. Furnished in four classifications, (1) blank and rough cored nibs, (2) rough cored dies, (cased), (3) semi-finished, rough drilled dies, (cased), (4) finished dies, ready to use.



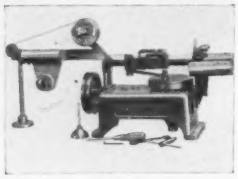
WRITE FOR CATALOG

WILLEY'S CARBIDE TOOL CO.
SOLE MAKERS OF WILLEY'S METAL
1342 W. Vernor Highway Detroit 1, Michigan

WIRE CUTTING & SHAPING MACHINES

For Wire From .0005" to 1/16" and Flat Stock up to 1/8"

No. 111

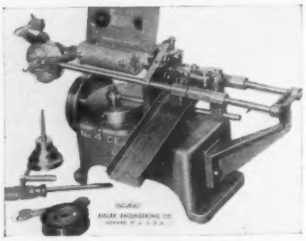


No. 4-E

Eisler fine wire cutting and forming machines have been in use over twenty-five years.

No. 111-H

SEND US YOUR SAMPLES



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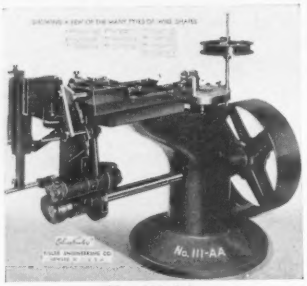

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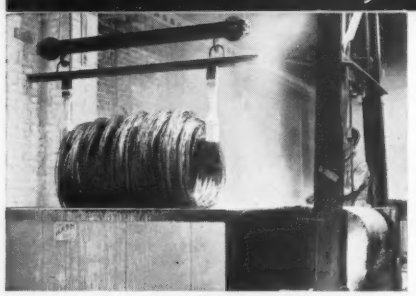
EISLER WIRE SHAPES

MORRISON FLASH BAKERS



Save Time

Cut Costs

Speed Production

Fifty-three Morrison Flash Bakers now in operation in 29 plants are proving to wire manufacturers that their cost is an investment that pays dividends because of these operational features—

1—Space saving—size of a lime tank
2—Fit straight line or circle setups
3—Reduce cleaning house fog
4—Rust-free rod
5—High capacity
6—Acid brittleness recovery of about 95%
7—Rod remains on hook
8—Only a few minutes required for baking even fine wire

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Associate Companies: MORRISON ENGINEERING OF CANADA, LTD. TORONTO, ONTARIO — CARRIER ENGINEERING CO., LTD. LONDON, ENGLAND

Edward J. P. Fisher, Manager of Sales, Morrison Engineering Co.

Edward J. P. Fisher was recently appointed Manager of Sales for The Morrison Engineering Corporation of Cleveland, Ohio. A native of New Jersey, received his early technical training at the Worcester Polytechnic Institute and the School of Mines, Columbia University.

EDWARD J. P. FISHER

SINCE 1921, he has developed a broad metallurgical engineering and manufacturing experience in the service of such concerns as R. Wallace & Sons Manufacturing Company, Carpenter Steel Company, Diamond Chain & Manufacturing Company, Keystone Steel & Wire Company, and the Aetna-Standard Engineering Company.

✦ ✦ ✦

MR. Fisher is widely known in the wire industry both as first recipient of the Wire Association Annual Medal of Award in 1934, and for his work on the installation and initial operation of the first steel wire mill on the island of Newfoundland as consultant for the United Nail and Foundry Company Limited at St. Johns.

✦ ✦ ✦

HE is also an active member of the American Society for Metals and is a past chairman of the Indianapolis Chapter 1928-29, and of the Peoria Chapter 1934-35.

Federal Electric Products Company Purchases Electrical Division of Colt Patent Fire Arms Mfg. Co.

MONTHS of heightened activity were climaxed on July 1st with the completion of all negotiations and the signing of final papers for the purchase of the Electrical Division of Colt's Patent Fire Arms Manufacturing Company by Federal Electric Products Company, Newark, New Jersey.

✦ ✦ ✦

THE consolidation of these two organizations under the Federal name was seen by the industry as a move to bring together the manufacturing, engineering and selling facilities of two companies with complimentary and supplementary markets. This undoubtedly will make Federal one of the largest and most prolific producers of electrical control devices in its field. It is estimated that the combined area of the two plants totals more than seven acres.

✦ ✦ ✦

Evaluating Apprentices

THIS 20-page booklet meets a long-felt need for technical advice on how to determine the cost of training apprentices, as compared with the value of their production while in training; as well as how to record the skills apprentices acquire as they advance from one step of their training to the next. It has been prepared especially for training directors and others responsible for apprentice training. These pertinent questions are discussed comprehensively from the practical standpoint in two fact-finding articles contained in the booklet, entitled respectively "Cost of Training and Value of Production of Apprentices" and "Apprentice Record Cards".

✦ ✦ ✦

COPIES of this booklet may be obtained by writing to Apprentice-Training Service, Bureau of Training, War Manpower Commission, Washington, D. C.

NILSON AUTOMATIC PRESS AND FOUR SLIDE MACHINE

FOR SWAGING, STAMPING, PIERCING, BLANKING, FORMING OF COILED METAL

WE also build machines for forming Paper Clips, Buckles, Gate Hooks, Coat and Hat Hooks, Ceiling Hooks, Wire Ears, Cable Rings, Screw Eyes, Sash Chains, Automobile Side Chains, Flat Open Link Chains, Staples, Cotter Pins, Hose Clamps, Etc., and Wire Straighteners, Wire Reels, Frame Bending Machines and Special Presses.

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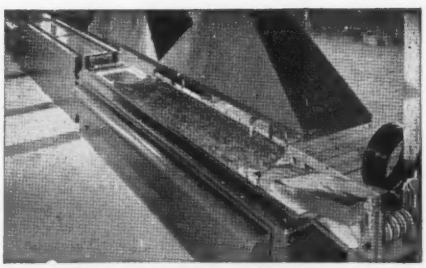
The *Trauwood* PROCESS

OUTSTANDING ADVANTAGES

Higher and more uniform physical and fatigue properties.
No surface decarburization or scale.
Faster wire speeds . . . greater production.
Equipment fully automatic and easy to operate.
Control of heating and cooling cycles extremely accurate.
Thermal efficiency of the process very high.
Much finer grained structure possible.
High quenching temperatures rapidly attained.
Adaptable to high alloy and austenitic steel wire and strip (annealing of stainless).



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The Trauwood Process, new in principle, eliminates high temperature furnaces and lead pots with their excessive maintenance costs and low thermal efficiencies. More positive temperature control is possible and quenching is done in a RISING temperature—instead of falling, as in conventional heat treating methods. The rapid rate of heating (4 to 5 times as fast as furnace heating) increases production and uniformly produces a finer grained product with higher physical and fatigue values.

Wire and rod patented by the Trauwood Process insures easier drafting and makes heavier reductions possible. In conjunction with the Trauwood patenting equipment, pickling, coating and baking can be made continuous, eliminating expensive handling and delay, materially reducing costs as compared with ordinary methods.

Complete details of the Trauwood Process will be furnished you on request. Our engineers will help you solve your continuous wire and strip patenting, tempering, and annealing problems. Write today.

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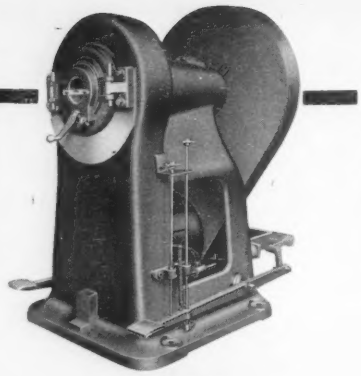

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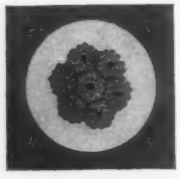
***and* AUTOMATIC FEED**

ATTACHES FITTINGS TO CABLE 10 TO 15 TIMES FASTER
THAN FORMER MODEL OF "STANDARD" CABLE SWAGER

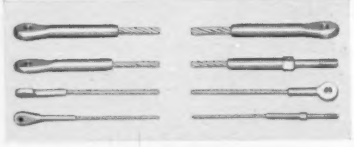
"Standard's" redesigned Cable Swager provides same swaging action as regular "Standard" Cable Swager . . . but eliminates extra operator formerly required, as well as need for removing dies after each cable swaging operation. Fittings have smooth surface and are swaged so firmly to exact dimensions on cable, that fittings and cable strands appear fused.

Write for folder "Standard Cable Swagers."



Flow of shank metal around strands without distorting cable.

Shank-type fittings as swaged on cable.



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Two Papers on Black Oxide Finishes Published

THE shortage of metals for protective coatings on steel has greatly emphasized the use of ferro-oxide finishes to replace them with a coating that will serve both as a substitute, and in many cases, a new type of coating that will continue to serve adequately as a finish for metal.

✦ ✦ ✦

MARK Weisberg and Edward A. Parker of the Alrose Chemical Co., Cranston, R. I., have contributed two papers to the literature on this subject that will help users and prospective users of the black oxide finish to evaluate the advantages of these coatings. The first is entitled, "Advantages and Disadvantages of Black Oxide Coatings" and the second, "Supplemental Protection for Black Oxide Finishes."

✦ ✦ ✦

IN these papers are described the methods by which the coating is put onto steel, the results of various types of tests, and proven methods of increasing the natural corrosion resisting qualities of the finishes. Copies will be mailed to interested persons on request.

✦ ✦ ✦

Manual on Silicon Copper Alloys

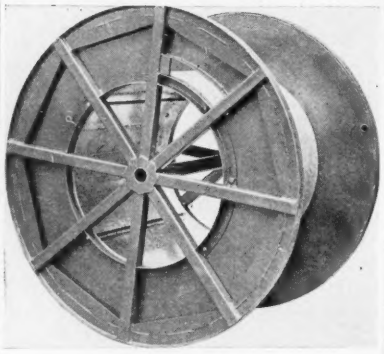
BRIDGEPORT Brass Company, 30 Grand Street, Bridgeport, Conn., has published a manual on Duronze, their trade name for a series of high copper alloys containing small quantities of silicon, aluminum, tin, etc., that is a veritable handbook of operating and engineering data on the applications, processing techniques, properties and physical characteristics of these useful alloys.

✦ ✦ ✦

DURONZE is supplied in sheet, strip, rod, wire, tubing and ingot form (for remelting), and in those forms of interest to the wire industry, such as for cold heading and other operations in the fabrication of bolts, nuts, screws, washers, chains, etc. Anyone concerned with the production of products

ALL STEEL REELS

FOR SHIPPING
FOR STORING
CABLE AND WIRE



Last Longer

Constructed of corrosion resisting materials, three to four times the life of a wooden reel is a reasonable expectancy.

Give Greater Protection

Smooth inner surfaces, much greater strength with the absence of all cutting or abrading projections — these protect not only the cable but the men handling it.

Save On Freight

Appreciably lighter than wooden reels — cost less to ship — a cumulative saving that more than offsets increased first cost.

Reduce Investment

The longer life of R. B. Hayward Steel reels reduces the investment in reel equipment.

Write for description of construction and prices.

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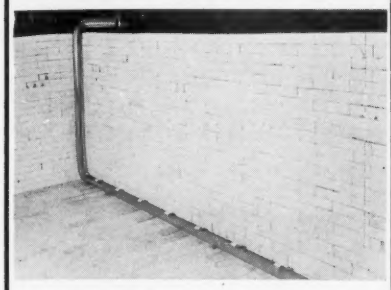

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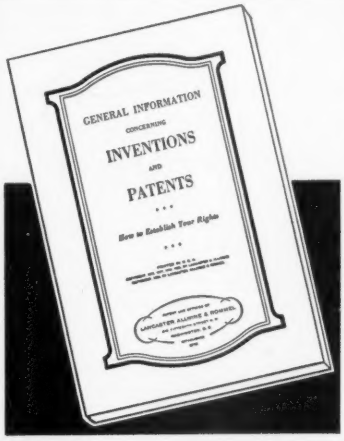

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in which copper alloys are used, will find the eighty pages of this informative book filled with useful and practical data.

✦ ✦ ✦

IF a copy is wanted please write to Dept. "W", asking for the Duronze Manual.

✦ ✦ ✦

Allegheny Ludlum Appoints Engineer

R. **H. Thielemann** has been appointed development engineer for Allegheny Ludlum. The author of several technical papers on metallurgy, he was formerly associated with the research laboratory of the General Electric Company at Schenectady, N. Y.

✦ ✦ ✦

MR. Thielemann was graduated from Oregon State College, and assisted in the development work and material studies for the Bonneville Dam Project.

✦ ✦ ✦

AFTER serving as a student engineer of the Bethlehem Steel Co. at their Pacific Coast plants, Mr. Thielemann joined the General Electric Co. in 1936. He pioneered in the development of high temperature creep-rupture testing technique.

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To Come To The 1944
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At The
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October 16-19 Inclusive

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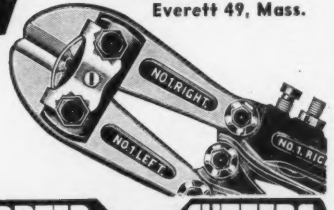

PORTER HKP CUTTERS

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For a satisfactory, durable black finish, an indispensable requisite is a chemically clean surface.

New, second edition of this popular booklet discusses the various phases of surface preparation in detail. Here are fully described specialized Oakite degreasing methods that help you obtain CHEMICALLY CLEAN surfaces on a FAST, low-cost basis . . . so that you secure the desired uniform black finish on your wire product. Send for your FREE copy TODAY!

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Report on Gas-Filled Cable Design

THE soundness of gas-filled cable design has been proved by more than five years of practical operating experience and this type of cable can no longer be considered experimental, said G. B. Shanklin, General Electric Engineer, at a recent meeting in St. Louis.

✦ ✦ ✦

MR. Shanklin's paper, "Gas-filled Cable Research and Experience," stated that during the past five years of operation no service failures or signs of insulation deterioration have been recorded. During this period approximately 20 separate installations involving low, medium and high-pressure types, at voltage ratings from 15 kv to 120 kv, have been produced in this country by cable manufacturers. Most of the experience has been with the low-pressure type at voltage ratings up to 38 kv. There was, however, limited experience with the medium and high-pressure types. In all cases, uniformity and control of dielectric characteristics through gas pressure control, simplicity of design and operation, economy, self-supervision of mechanical defects and other features, assured future usefulness.

✦ ✦ ✦

THE author compared initial ionization starting voltage as a function of gas pressure, over a range from atmospheric to 225 psi, with theoretical results and explained the significance of this starting voltage as related to practical gas-filled cable design.

✦ ✦ ✦

DATA on long time load cycle endurance tests on gas-filled cable, covering a wide range of impregnating compound viscosities, were presented. The self-grading and self-healing properties of gas-filled cable were shown to be related to the viscosity of the impregnating compound. These beneficial effects increase with decrease in viscosity, and corresponding increase in mobility, of the impregnating compound. The effects resulting from the compound

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STAMFORD, CONN.

are drawn into voids and other critical locations by the electrical stress field. On the basis of these data, Mr. Shanklin demonstrated an optimum range of compound viscosities for best all-around results.

✦ ✦ ✦

Norton Publishes Book on Contributions to Industry

THE Norton Company, Worcester, Mass., has put out an impressive 74 page book in color entitled, "Norton Folks Contribute to Industry."

✦ ✦ ✦

DESIGNED particularly for their employees to make them, especially the newer ones, more familiar with the types of products they are producing, their fields of application in industry and the importance of abrasives in industrial production, the book nevertheless has a definite interest to users of Norton abrasives.

✦ ✦ ✦

IT illustrates and describes the widely diversified uses of abrasives in the many production operations of war and peace, and shows many particular grinding operations and pictures of the finished products into which these abrasive finished parts enter.

✦ ✦ ✦

Spot Welder Catalogs

FOLLOWING the recent issue of the 28 page "Light Type Bench Spot Welder" Bulletin, featuring the complete line of small spot welding machines from ¼ to 3-KVA, manufactured by the Eisler Engineering Co., Newark, New Jersey,—extensively used for Filament welding, Radio, Electronics, Cathode Ray Tubes, etc. Jewelry and Wire Welding, the Company just published a new 58 page catalog, #CE-44W, entitled "Spot Welders", showing all types of standard and many special resistance welding machines manufactured by them.

✦ ✦ ✦

THE new catalog contains over 300 illustrations and diagrams of individual foot, air and motor operated welders of the Eisler line, shows application and installational views and gives specifications and operating and technical data on the various models. An instruction welding chart is included.

✦ ✦ ✦

THE catalog covers the developments of 25 years of specialized experience of the Eisler Engineering Co. in designing and manufacturing of all types of resistance welding machines. Copy of the catalog is available upon request.

Wartime

Wire for a thousand uses

Versatile Continental wire is produced in sizes from 34 gauge to ⅝ inch, in standard and special shapes . . . and in a wide range of analyses, tempers and coatings.

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(The Superior Sheet Steel Co., Canton, Ohio — a subsidiary)

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CONTINENTAL SUPERIOR STEEL

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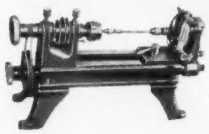
SHEETS: Black, Galvanized, Copperior, Hot and Cold Rolled, Special Coated, Long Terne, etc

WIRE: Bright Basic, Annealed, KONIK, Coppered, Tinned, Special Manufacturer's, etc.

ROOS

WIRE DRAWING DIE MACHINERY



LAPPING MACHINES
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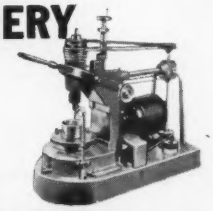
GRINDERS



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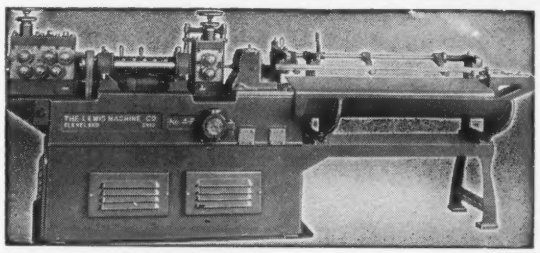
LEWIS TRAVEL-CUT WIRE STRAIGHTENING and CUTTING Machines



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Automatic
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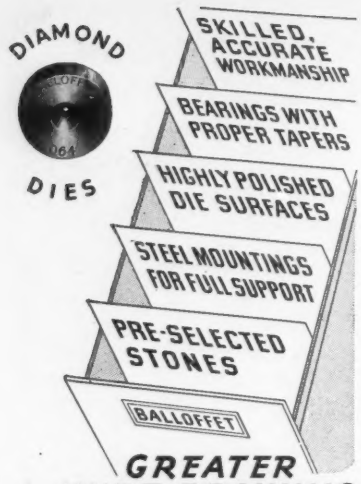
D. J. DeBoer has been appointed director of the Copper Wire Engineering Association, St. Louis. Mr. DeBoer's experience in the field of electricity includes affiliation with General Electric Co., Schenectady, N. Y.; Sargent & Lundy Inc., Chicago engineers; Harza Engineering Co., Columbus, Neb. From 1936 to the present time he served as chief electrical engineer for the Loup River Public Power District, Columbus, Neb.



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Sub-Sieve Diamond Powders for Die Work

(Continued from Page 484)

Decantation method with which I have had considerable experience and obtained excellent results.

PART II
Will be published in The September issue and will contain the following:-
"Helpful Formulae"
"How to Increase Facilities"
"Selection of a Liquid"
"Experimenting with Decarbation"
"Difficulties and How to Overcome Them"

The Foreman's Part in Better Labor Relations

(Continued from Page 487)

men, including washrooms and locker rooms, separate or private parking space, etc. Free the foremen from punching a time-clock. Supply different badges, different-color pay envelopes. Encourage the foremen to keep together, and foster a team spirit and a foreman **esprit d' corps.** Just as in the army, industrial "non-com clubs" have a distinct morale value.

✦ ✦ ✦

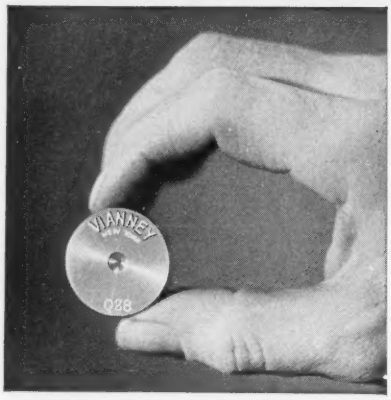
THE evidence presented in this summary of the foremen situation in industry today is far from complete. But it is sufficient to show that foremen as a whole can do a great deal more toward cementing employer-employee relations and, second, that top management has plenty of room for improvement in its handling of the foremen themselves. If both segments of management will do their best to overcome the problem, the benefits will be visible and sure — and within short order.

✦ ✦ ✦

ABOUT THE AUTHOR

Mr. Cool was a labor relations consultant and successful business man before founding the Labor Relations Institute in 1938, since which time the organization has grown to a membership of 6,500 companies. In this article, as in his informal talks to industry, the author has given generously from the reports and surveys of The Institute's Field Staff — assuring up-to-the-minute, practical suggestions which will be of real value to every reader.

VIANNEY
Famous Wire Drawing Diamond Dies



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✦ ✦ ✦

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✦ ✦ ✦

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✦ ✦ ✦

COMPANIES interested in applying this method of pickling or evaporation to their own production are invited to send for the booklet.

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(Case #52)

Type of Wire: Copper-nickel alloy.
Speed: 2200 ft./min.
Reduction: .025 to .0063.
No. of Dies: 12
Drawn: Wet
Dies: Diamond

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Bulletin on Windup Machine

A NEW bulletin, containing engineering information on a constant-speed, constant-tension windup machine for wire, cable, tapes, cordage and other continuous and semi-continuous materials, has been published by the Industrial Oven Engineering Company, 11621 Detroit Ave., Cleveland 2, Ohio.

✦ ✦ ✦

THE bulletin describes what it is, how it works, its engineering features and specifications, and the text is supported by diagrams and illustrations. A list of the operations in different fields to which this machine may be applied is also given.

✦ ✦ ✦

COPIES may be secured upon request direct to the Company.

✦ ✦ ✦

New Spooling Machine Catalog

CONSISTENT with their policy of constantly developing improvements in wire spooling machines, Fidelity Machine Co., 3908 Frankford Ave., Philadelphia, Pa., have issued a new catalog describing and illustrating several new types of spoolers.

✦ ✦ ✦

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✦ ✦ ✦

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✦ ✦ ✦

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✦ ✦ ✦

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✦ ✦ ✦

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Oakite Products, Inc., New York, N. Y.

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Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.

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Syncro Machine Co., Rahway, N. J.

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Scudder, E. J., Foundry & Machine Co., Trenton, N. J.

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New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

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Morrison Engr. Corp., Cleveland, Ohio

BAKERS—Hi-Speed
Carl-Mayer Corp., The, Cleveland, Ohio.

BAKERS—Rod and Wire
Carl-Mayer Corp., The, Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Morrison Engr. Corp., Cleveland, Ohio
Moslo Machinery Co., Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N. Y.

BELTS—Wire
Wickwire Spencer Steel Co., New York, N. Y.

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O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

BOBBINS—Braider and Wire Weaving
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

BORON CARBIDE—
Norton Co., Worcester, Mass.

BRAKES & SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

BRICKS—Acid Proof
Keagler Brick Co., Steubenville, Ohio.

CABLE LACQUERING OVENS
Industrial Oven Engr. Co., Cleveland, Ohio.

CABLE—Steel and Copper
Brewer Mfg. Co., Muncy, Pa.

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.

CASTINGS—Wire Mill
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.

CEMENTS—Acid Proof
Sauereisen Cement Co., Pittsburgh, Pa.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

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Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

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Magnus Chemical Co., Garwood, N. J.
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Vaughn Machinery Co., Cuyahoga Falls, O.
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Roebling's, John A., Sons Co., Trenton, N. J.
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Torrington Mfg. Co., Torrington, Conn.

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COMPOUNDS—Metal Finishing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

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Apex Alkali Products Co., Philadelphia, Pa.
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American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.

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Gilron Products Co., Cleveland, Ohio.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Shell Oil Co., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

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Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

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Morgan Construction Co., Worcester, Mass.
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CUTTING TOOLS—Carbide
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Vascoloy-Ramet Corp., North Chicago, Ill.

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Porter, H. K., Inc., Everett, Mass.

DIAMONDS—Industrial
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Callite Tungsten Corp., Union City, N. J.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., New York, N. Y.
Vianney Wire Die Wks., New York, N. Y.

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Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., New York, N. Y.

DIAMOND TOOLS—
Rusch Wire Die Corp., New York, N. Y.

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DIES—Diamond
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Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Cochaud Wire Die Corp., New York, N. Y.
Fort Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
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Luginbill Wire Die Co., Fort Wayne, Ind.
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Vianney Wire Die Works, New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

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Robertson, John, Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
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Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
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Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Luginbill Wire Die Co., Fort Wayne, Ind.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Rod and Tube Drawing
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Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., New York, N. Y.
Tungsten Electric Corp., Union City, N. J.
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Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

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Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

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Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
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Kelly Wire Die Corp., New York, N. Y.
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Scudder, E. J., Foundry & Machine Co., Trenton, N. J.
Standard Machinery Co., Providence, R. I.
Vaughn Machinery Co., Cuyahoga Falls, O.

DRUMS—Flange Steel
Hubbard Spool Co., Chicago, Ill.
Stevens Metal Products Co., Niles, O.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

DRYING AND PRE-HEATING ROOMS—
Industrial Oven Engr. Co., Cleveland, O.

DRYING EQUIPMENT—
W. S. Rockwell Co., New York, N. Y.
Ross, J. O., Engr. Corp., New York, N. Y.

ENGINEERS—Consulting Wire Mill
Hartley, George D., Worcester, Mass.
Lewis, Kenneth B., Worcester, Mass.

EQUIPMENT—Insulation Testing
Davis, R. L., Electric Co., Wallingford, Conn.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FENCES AND FENCING—Wire
Wickwire Spencer Steel Co., New York, N. Y.

FLASH BAKER—
Morrison Engr. Corp., Cleveland, Ohio

FLUXES—Soldering
American Chemical Paint Co., Ambler, Pa.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.

FRICTION PAY-OFF STANDS—
Industrial Oven Engr. Co., Cleveland, O.

FURNACES—Annealing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Morrison Engr. Corp., Cleveland, Ohio
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Trauwood Engr. Company, Cleveland, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio

WHERE TO BUY, Continued

FURNACES—Automatic
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Morrison Engr. Corp., Cleveland, Ohio
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Brazing
Electric Furnace Co., Salem, O.
Firth-Sterling Steel Co., McKeesport, Pa.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, O.
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Electric
Eisler Engineering Co., Newark 3, N. J.
Electric Furnace Co., Salem, Ohio
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio
Trauwood Engr. Co., Cleveland, Ohio

FURNACES—Hardening & Tempering
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Morrison Engr. Corp., Cleveland, Ohio
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio
Trauwood Engr. Co., Cleveland, Ohio

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio
Robertson, John, Co., Brooklyn, N. Y.
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio

FURNACES—Non-Oxidizing
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Morrison Engr. Corp., Cleveland, Ohio
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio

FURNACES—Normalizing
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Morrison Engr. Corp., Cleveland, Ohio
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.

FURNACES—Salt Bath
Electric Furnace Co., Salem, Ohio
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio
Eisler Engineering Co., Newark 3, N. J.
Electric Furnace Co., Salem, Ohio
Morrison Engr. Corp., Cleveland, Ohio
Rockwell, W. S., Co., New York, N. Y.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio

GALVANIZING EQUIPMENT—
Wilson, Lee, Engr. Co., Cleveland, Ohio

GALVANIZING KETTLES—
National Annealing Box Co., Washington, Penna.

GRINDERS—Roll
Norton Co., Worcester, Mass.

HI-SPEED BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio

HOISTS—Electric Travelling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

INHIBITORS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.

INSULATION LACQUERING SYSTEMS—Continuous
Industrial Oven Engr. Co., Cleveland, O.

KETTLES—Galvanizing, Annealing, Tinning, etc.
National Annealing Box Co., Washington, Penna.

LATHES—Die Reaming
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Morgan Construction Co., Worcester, Mass.
Roos, H. & G., Tool & Mfg. Co., Montclair, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry & Machine Co., Waterbury, Conn.

LIME—
Warner Co., Bellefonte, Pa.

LININGS—Acid and Alkali Proof
Ceilcote Co., The, Cleveland, Ohio

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

LUBRICANTS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y. Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Robertson, John, Co., Brooklyn, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
Fidelity Machine Co., Philadelphia, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Brazing
Syncro Machine Co., Rahway, N. J.

MACHINERY—Bunching
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Electric
American Insulating Mach'y. Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Chain Making
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Coilers
Broden Construction Co., Cleveland, Ohio
Eisler Engineering Co., Newark 3, N. J. (for Tungsten Wire)
Morgan Construction Co., Worcester, Mass.
New England Butt Co., Providence, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Copper Wire Drawing and Rolling
American Insulating Machy. Co., Philadelphia, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire
American Insulating Machy. Co., Philadelphia, Pa.
Fidelity Machine Co., Philadelphia, Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Cutting
Broden Construction Co., Cleveland, Ohio
Eisler Engineering Co., Newark 3, N. J.
Lewis Machine Co., The, Cleveland, Ohio
Moslo Machinery Inc., Cleveland, Ohio.
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Porter, H. K., Inc., Everett, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Die Making
Firth-Sterling Steel Co., McKeesport, Pa.
Roos, H. & G., Tool & Mfg. Co., Montclair, N. J.

MACHINERY — Die Making for Forming Special Shapes
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

MACHINERY—Draw Benches
Broden Construction Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Edging
Broden Construction Co., Cleveland, Ohio.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Enameling
American Insulating Mach'y. Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Extruding
Robertson, John, Co., Brooklyn, N. Y.
Royle, John, & Sons, Paterson, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark 3, N. J.

MACHINERY—Flat Wire
Broden Construction Co., Cleveland, Ohio
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Forming
Eisler Engineering Co., Newark 3, N. J.
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Galvanizing
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Galvanizing Wire
Broden Construction Co., Cleveland, O.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Gang Winders
Fidelity Machine Co., Philadelphia, Pa.
Robinson Mfg. Co., Muncy, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Philadelphia, Pa.

MACHINERY—Lead Encasing Presses, etc.
Robertson, John, Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
Robertson, John, Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Material Handling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

WHERE TO BUY, Continued

MACHINERY — Measuring Wire & Cable
Davis, R. L., Electric Co., Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wis.
Lyon-Vail Machine Co., Brockton, Mass.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Broden Construction Co., Cleveland, Ohio.
Glader, Wm., Machine Works, Chicago, Ill.
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Pointing
Broden Construction Co., Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Quill Winding
Fidelity Machine Co., Philadelphia, Pa.

MACHINERY—Rod Mill
Broden Construction Co., Cleveland, Ohio
Morgan Construction Co.. Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.

MACHINERY—Rolling Mill
Broden Construction Co., Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Rubber for Insulating Wire
Royle, John, & Sons, Paterson, N. J.

MACHINERY—Rubber Strip Covering
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Screw Wire
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila., Pa.
Broden Construction Co., Cleveland, Ohio
Emory, Robert J., Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I. (Special Designs)
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spooling
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark 3, N. J.
Emory, Robert J., Co., Newark, N. J.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, Ohio
Lewis Machine Co., The, Cleveland, Ohio
Moslo Machinery Co., Cleveland, Ohio
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Stranding
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Construction Co., Cleveland, Ohio
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Swaging
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Testing
Scott, Henry L., Co., Providence, R. I.

MACHINERY—Testing Size of Wire
Davis, R. L., Electric Co., Wallingford, Conn.

MACHINERY—Testing Spring
Standard Machinery Co., Providence, R. I.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Welding Wire
Eisler Engineering Co., Newark 3, N. J.
Micro Products Co., Chicago, Ill.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa
Eisler Engineering Co., Newark 3, N. J.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wind-up (Constant Tension, Variable Speed)
Industrial Oven Engr. Co., Cleveland, O.

MACHINERY—Wire Bending
Eisler Engineering Co., Newark 3, N. J.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

MACHINERY—Wire Drawing
American Insulating Mach'y Co., Phila., Pa.
Broden Construction Co.. Cleveland. Ohio
Eisler Engineering Co., Newark 3, N. J.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Wire Measuring
Durant Mfg. Co., Milwaukee, Wis.
Lyon-Vail Machine Co., Inc., Brockton, Mass.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Tinning
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Wood Screw
National Machinery Exchange (Used), New York, N. Y.

MATERIAL HANDLING EQUIPMENT
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

MILLS—Tandem Rolling and Edging
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

NAILS—Wire
Youngstown Sheet & Tube Co., Youngstown, Ohio.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.

OILS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Shell Oil Co., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

OVENS—Cable Lacquering
Industrial Oven Engr. Co.. Cleveland, Ohio
W. S. Rockwell Co., New York, N. Y.

OVENS—Dehydrogenizing
Industrial Oven Engr. Co.. Cleveland, O.
W. S. Rockwell Co., New York, N. Y.

OVENS—Industrial
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Oven Engr. Co., Cleveland, Ohio
Morrison Engr. Corp., Cleveland, Ohio
W. S. Rockwell Co., New York, N. Y.
Ross, J. O., Engineering Corp., New York, N. Y.

OVENS—Welding Rod Coating
Industrial Oven Engr. Co., Cleveland, O.
W. S. Rockwell Co., New York, N. Y.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PAINTS—Marine
American Chemical Paint Co., Ambler, Pa.

PAINTS—Structural Steel
American Chemical Paint Co., Ambler, Pa.

PANS—Lead and Spelter
National Annealing Box Co., Washington, Penna.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Creped Wrapping
Crepe-Kraft Co., Newark, N. J.

PAPER TESTERS—
Scott, Henry L., Co., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine and Rommel, Washington, D. C.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.

PICKLING TANK LININGS—
Ceilcote Co., The, Cleveland, O.
Keagler Brick Co., Steubenville, Ohio.
Sauereisen Cement Co., Pittsburgh, Pa.

PIPES AND FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

PLASTIC TESTERS—
Scott, Henry L., Co., Providence, R. I.

POTS—Lacquer
Industrial Oven Engr. Co., Cleveland, O.

POTS—Lead Melting
Robertson, John, Co., Brooklyn, N. Y.

POWDER—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.

PRESSES—Hydraulic and Mechanical
Robertson, John, Co., Brooklyn, N. Y.
Standard Machinery Co., Providence, R. I. (Mechanical Only)

PRESSES—Lead
Robertson, John, Co., Brooklyn, N. Y.

PRESSURE VESSELS—
National Annealing Box Co., Washington, Penna.

WHERE TO BUY, Continued

PULLERS—Wire
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
Robertson, John, Co., Brooklyn, N. Y.

REEL AND TENSION STAND—
Fidelity Machine Co., Philadelphia, Pa.
Moslo Machinery Co., Cleveland, Ohio
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS—Annealing and Stranding
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B. Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS AND SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B. Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS—Takeoff
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS—Vulcanizing and Impregnating
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B. Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS—Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REFRACTORIES—High Temperature
Norton Co., Worcester, Mass.

ROD BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio
Morrison Engr. Corp., Cleveland, Ohio
Moslo Machinery Co., Cleveland, Ohio
Ross, J. O., Engineering Corp., New York, N. Y.

RODS—Wire—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

ROLL STRAIGHTENERS—
Moslo Machinery Co., Cleveland, Ohio

ROPE—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Brewer Mfg. Co., Muncy, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott, Henry L., Co., Providence, R. I.

RUST PROOF COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.

RUST REMOVING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

SATURATION SYSTEMS—
Industrial Oven Engr. Co., Cleveland, O.

SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

SHEET—Steel
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.

SOAPS—Industrial and Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

SOLVENT RESIN SYSTEMS—Experimental
Industrial Oven Engr. Co., Cleveland, O.

SPOOLS—Annealing and Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

SPOOLS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

SPRINGS—Steel
Wickwire Spencer Steel Co., New York, N. Y.

STAMPINGS—Steel
Hubbard Spool Co., Chicago, Ill
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRAND—Steel and Copper
Brewer Mfg. Co., Muncy, Pa.

STRIP—Brass and Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.

STRIP METAL TESTERS—
Scott, Henry L., Co., Providence, R. I.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.

TANK LININGS—Brick
Ceilcote Co., The, Cleveland, O.
Keagler Brick Co., Steubenville, Ohio.
Nukem Products Corp., Buffalo, N. Y.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TANKS—Pickling
Haveg Corp., Newark, Del.
Heil Engineering Co., Cleveland, Ohio.
Nukem Products Corp., Buffalo, N. Y.
Sauereisen Cements Co., Pittsburgh, Pa.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.

TENSILE TESTERS—
Scott, Henry L., Co., Providence, R. I.

TESTING INSTRUMENTS—
Scott, Henry L., Co., Providence, R. I.

TOOLS—Wire Cutting
Porter, H. K., Inc., Everett, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS—
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

TUBE BENDERS AND FORMERS—
Ruesch, H. J., Machine Co., Newark, N. J.

TURKS HEADS—Friction and Power Driven
Standard Machinery Co., Providence, R. I.

VALVES AND FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark 3, N. J.
Micro Products Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio

WIND-UP AND UNWIND SYSTEMS—Continuous
Industrial Oven Engr. Co., Cleveland, O.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE—Cold Heading
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE—Enameled for Coils
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Flat
Roebling's, John A., Sons Co., Trenton, N. J.

WIRE—Manufacturers
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Franklin Steel & Wire Co., Brooklyn, N. Y.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Wickwire Spencer Steel Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE—Music
Jersey Steel & Wire Corp., Irvington, N. J.

WIRE—Nickel Silver and Phosphor Bronze
Callite Tungsten Corp., Union City, N. J.
Hudson Wire Co., Ossining, N. Y.

WIRE—Non-Ferrous to Specification for Special Purposes
Callite Tungsten Corp., Union City, N. J.
Hudson Wire Co., Ossining, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Wickwire Spencer Steel Co., New York, N. Y.

WIRE—Stainless Steel
Callite Tungsten Corp., Union City, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Franklin Steel & Wire Co., Brooklyn, N. Y.
Jersey Steel & Wire Corp., Irvington 11, N. J.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Franklin Steel & Wire Co., Brooklyn, N. Y.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire Spencer Steel Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE AND STRIP—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE TESTERS—
Scott, Henry L., Co., Providence, R. I.

WIRE, WEAVING—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

WRAPPING PAPER—Creped
Crepe-Kraft Co., Newark, N. J.

YARN TESTERS—
Scott, Henry L., Co., Providence, R. I.

YARNS—Insulating
Cheney Bros., New York, N. Y.

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ENAMELED ALLOY
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TWISTED MULTIPLES
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CELANESE COVERED
GLASS FIBRE COVERED
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SPECIALS TO ORDER

There's more to present day engineering and design problems than shortages of materials, priorities, etc. There is also the question of whether specifications have been rigidly adhered to. Wire, for example, must meet such requirements as specific electrical properties, flexibility, tensile strength, laying speed, uniformity, etc.

Whether it's a buyer's or a seller's market, WINCO magnet wire products are drawn to exact specifications. Uniformity of product is guaranteed by mercury process tests and careful supervision guards against variations in consistency, structure or electrical values.

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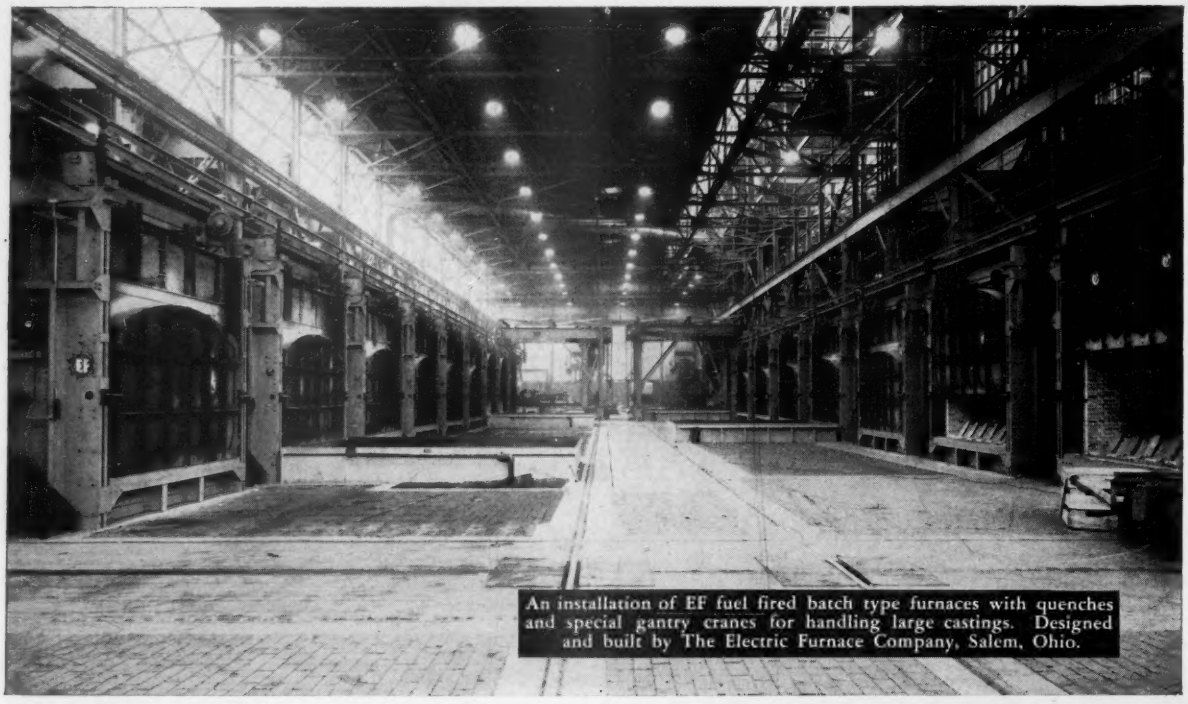
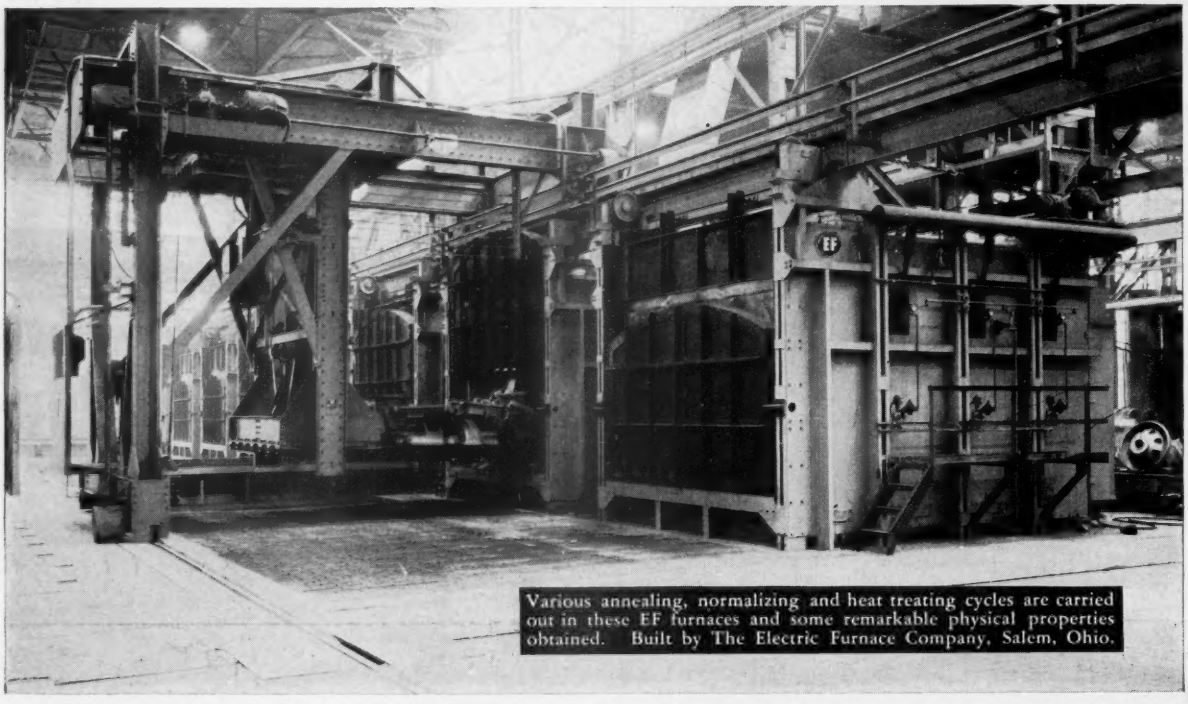


An installation of EF fuel fired batch type furnaces with quenches and special gantry cranes for handling large castings. Designed and built by The Electric Furnace Company, Salem, Ohio.



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